



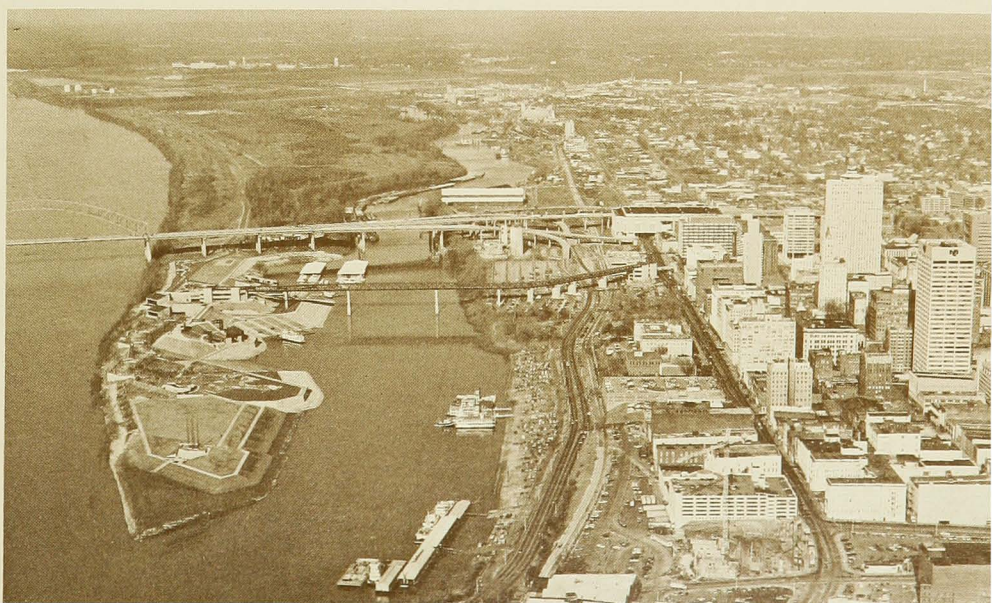
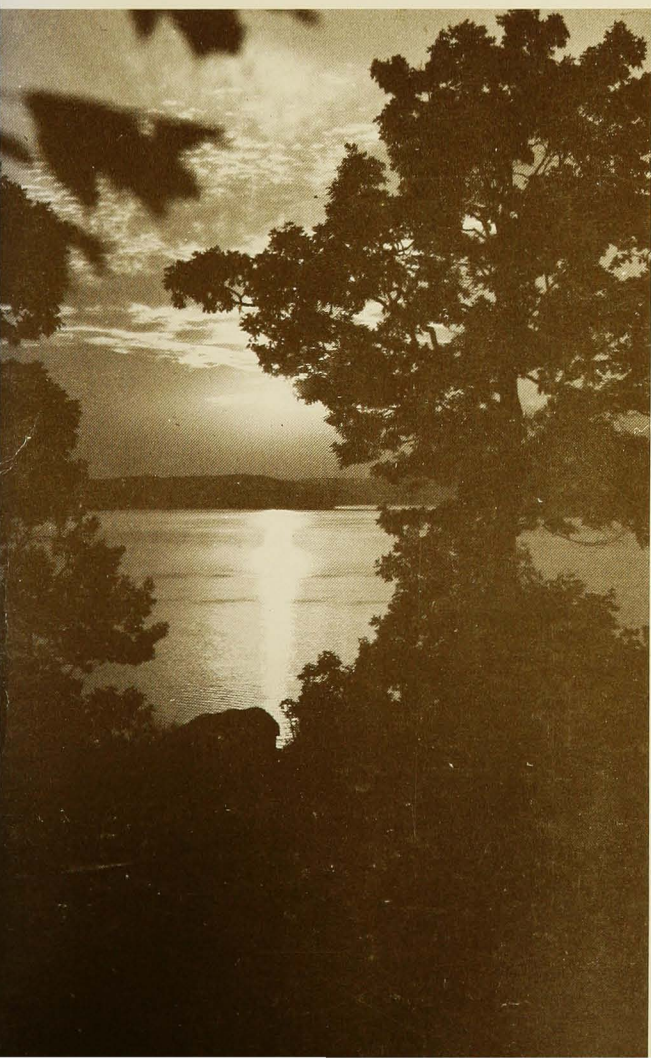
US Army Corps
of Engineers

Memphis District

Into The Second Century

Update - Century On The Mississippi

1976-1981



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Into the Second Century

MEMPHIS ENGINEER DISTRICT, 1976-1981

By

Bobby Joe Williams



**U.S. ARMY CORPS OF ENGINEERS
MEMPHIS DISTRICT
January 1983**

District Engineers



U.S. ARMY ENGINEER DISTRICT MEMPHIS



Lt. Col. E.B. WILBY
1928-1931



Maj. B.B. SOMERVELL
1931-1, 33



Maj. W.M. HOGE
1933-1935



Lt. Col. EUGENE REYBOLD
1935-1937



Lt. Col. DANIEL NOCE
1937-1940



Lt. Col. J.D. ANDREWS, JR.
1940-1941



Col. J. J. BAIN
1941-1943



Col. G.W. MILLER (AUS)
1943-1945



Col. B.M. HARLOE
1945-1947



Col. E.P. LOCK, JR.
1947



Col. L. H. FOOTE
1947-1952



Col. A.F. CLARKE, JR.
1952-1954



Col. E.B. DOWNING
1954-1957



Col. W. R. JONES, JR.
1957-1959



Col. M.L. JACOBS
1959-1962



Col. E. KIRBY-SMITH
1962-1964



Col. J.A. VIVIAN
1965-1967



Col. C.T. WILLIAMS
1968-1970



Col. J.V. PARISH, JR.
1970-1973



Col. A.C. LEHMAN
1973-1976



Col. R.W. LOCKRIDGE, JR.
1976-1979



Col. W. H. RENO
1979-1981



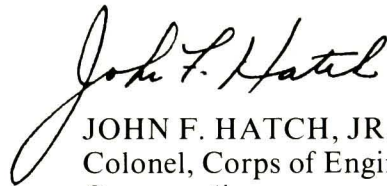
Col. J. F. HATCH, Jr.
1981-

FOREWORD

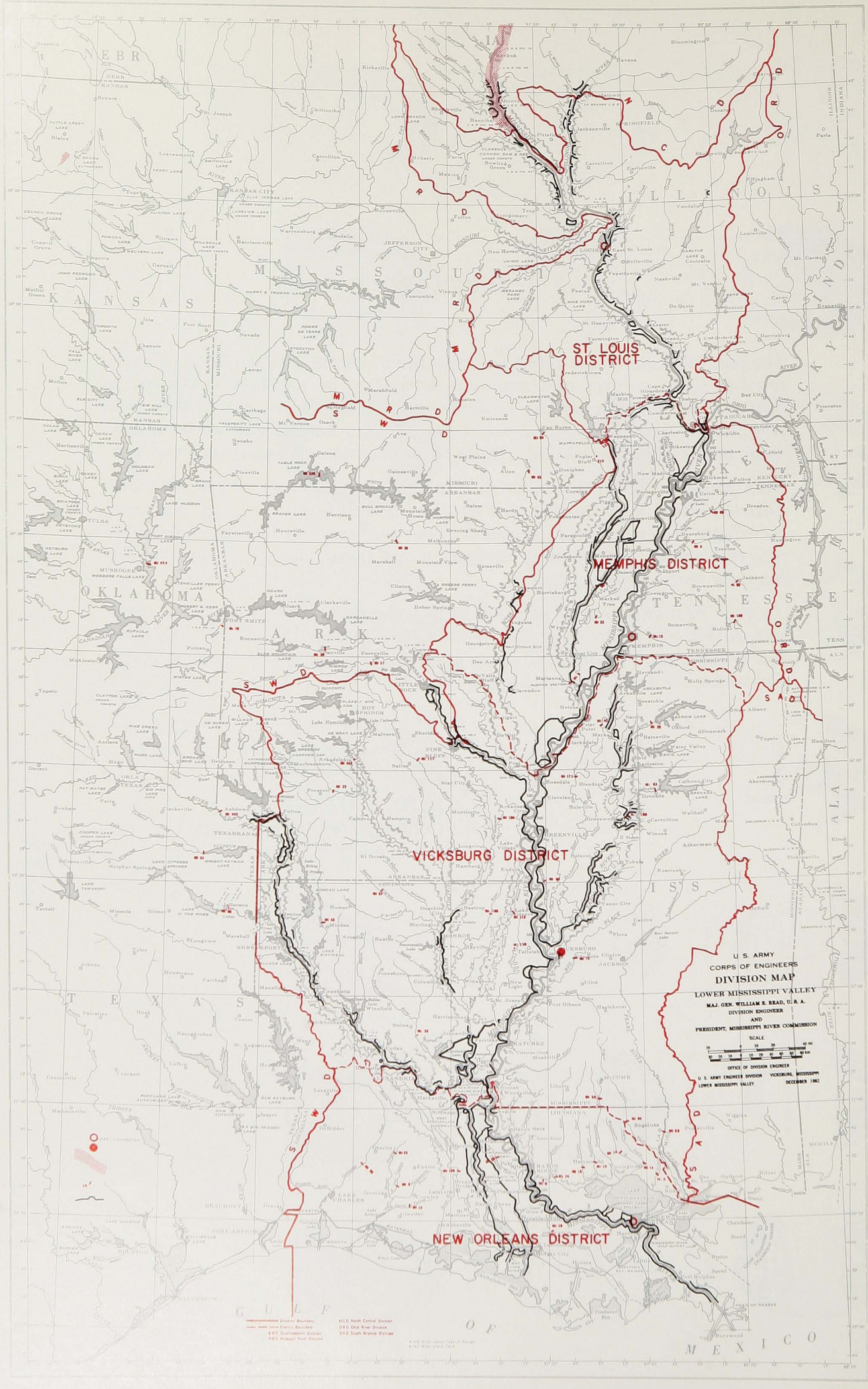
The year 1982 marks the 100th year that the Memphis District has worked to provide flood control and maintain navigation in the Lower Mississippi Valley. This six-year update is dedicated to those men and women who continue in their efforts to protect our families and neighbors from high water and to maintain the Mississippi River as a major transportation artery.

I am proud to be Commander at this time in the history of the Memphis District, and I look on this year as the celebration of a rebirth, a time to reevaluate our efforts and the efforts of our predecessors and search for more effective means of improving navigation and flood control for another one hundred years.

To each past and present member of the Memphis District family, I salute you during this Centennial year. Your expertise and tradition of excellence has brought and continues to bring great credit to the District, the Corps of Engineers, the U.S. Army and to our Nation.

A handwritten signature in black ink, reading "John F. Hatch, Jr.", with a stylized, flowing script.

JOHN F. HATCH, JR
Colonel, Corps of Engineers
Commanding



ST. LOUIS DISTRICT

MEMPHIS DISTRICT

VICKSBURG DISTRICT

NEW ORLEANS DISTRICT

U.S. ARMY
CORPS OF ENGINEERS
DIVISION MAP
LOWER MISSISSIPPI VALLEY
MAJ. GEN. WILLIAM E. READ, U.S.A.
DIVISION ENGINEER
AND
PRESIDENT, MISSISSIPPI RIVER COMMISSION
SCALE
0 10 20 30 40 50 60 70 80 90 100
MILES
0 16 32 48 64 80 96 112 128 144 160 176 192 208 224 240
KILOMETERS
OFFICE OF DIVISION ENGINEER
U.S. ARMY ENGINEER DIVISION, VICKSBURG, MISSISSIPPI
LOWER MISSISSIPPI VALLEY
DECEMBER 1962

Legend:
Mississippi District Boundary
Mississippi River
Mississippi River Tributaries
Mississippi River Branches
Mississippi River Delta
Mississippi River Mouth

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PREFACE

This is a history of the Memphis Engineer District. It brings up to date *A Century on the Mississippi* published in 1976. Memphis Engineer District is celebrating a century of work in the Memphis vicinity and the author wishes to thank the Corps of Engineers for allowing me to be a part of the celebration.

In the completion of this work, I want to thank the many people of the Memphis District that helped in so many ways to make the research and writing easier. I want to give special thanks to Mr. Ray Houston, Mr. Pat Flaherty, Ms. Betty Ferguson, Dr. Martin Reuss, and Miss Anne Ruth Coleman. Though others may argue with some of the conclusions in this history, the author takes full responsibility.

**Dedicated
To
Dennie and Abby**

CHAPTER I

The Mississippi River and the Engineers

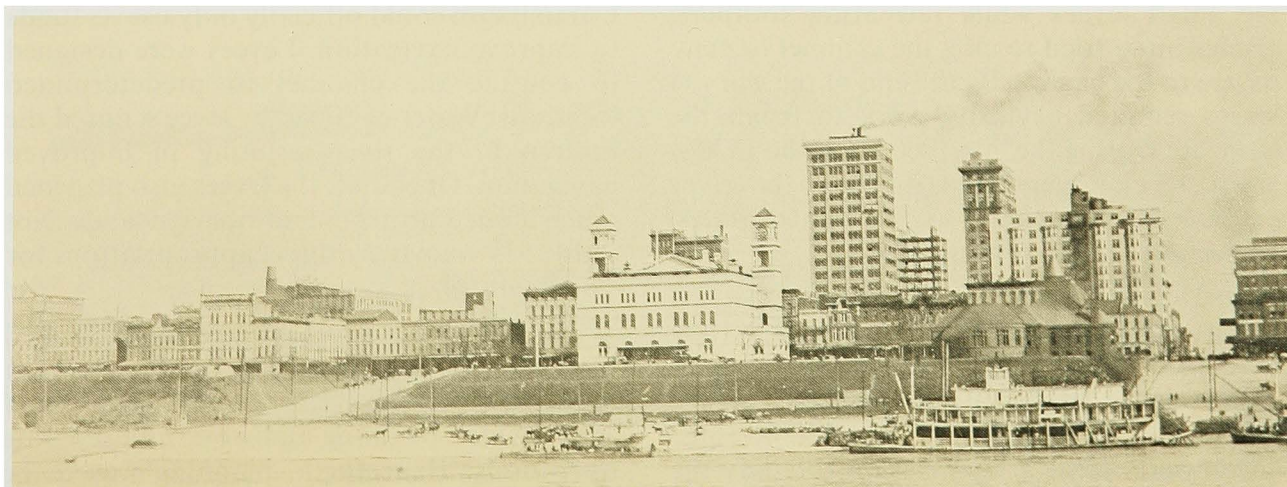
The Mississippi River's size and force have always challenged man. Starting as a small stream out of Lake Itasca in central Minnesota, the river begins a 2,340-mile journey to the Gulf of Mexico. In making the long journey, the river receives the drainage of all or part of 31 states comprising about 1,245,000 square miles—41 percent of the United States. Controlling this mighty river has become one of the most important tasks of the United States Army.¹

The shifting currents, sandbars, snags, and other navigation obstacles made journeying the Mississippi a hazardous adventure. When steamboat travel began on the Mississippi in the early nineteenth century, it became clear that this great commercial route must be cleared of natural obstructions. Improvement of navigation on the Mississippi received its first direct appropriation from the federal government in the River and Harbor Bill of 1824. President James Monroe was authorized to spend up to \$75,000 for snagging operations on the Ohio River and the Lower Mississippi. The President gave the Corps of Engineers the responsibility for clearing the river.²

Other than the shifting channel, snags in their many forms (snags, sawyers, and planters) were the main obstacles to navigation. Snagging operations became more efficient with the development of a workable snagboat by Henry Shreve. The Corps of Engineers adopted Shreve's newly designed snagboat for its snagging operations. The meager federal appropriations reflected the belief of Congress that improvement of navigation on the Mississippi was not primarily a federal responsibility. Yet, the first funds actually showed that Congress did accept some federal responsibility.

Still, steamboat traffic on the Mississippi increased dramatically. New Orleans recorded 2,300 steamboat landings in 1834—just 10 years after the first appropriations were made for snagging.³ States along the river were hard pressed to find the funds necessary for improvements. So-called River Conventions in many cities affected by the Mississippi began to call the problem of navigation a national problem.

In 1845 Memphis hosted a River Convention attended by many well-known political figures of the time, including John C. Calhoun.⁴ This



City of Memphis from the waterfront in 1914.

convention, followed by others, began to stress not just navigation improvements but levees for flood control, designed and paid for by the federal government. Of course, levees for navigation improvement were stressed, but protection from floods was also important. Such conventions began removing doubts about the Mississippi being a local problem.

Responding to public pressure, Congress passed two Swamp Lands Acts in 1849 and 1850. The acts transferred to most of the states along the Lower Mississippi "swamp and overflow land" on condition that proceeds from the sale of the land be used to build levees and drainage channels to develop the areas.⁵

Though levees proved useful to control floods, Congress, fearing it lacked constitutional authority, refused to consider flood control measures, but did authorize additional surveys. One such survey, completed in 1861 by Captain A. A. Humphreys and Lieutenant Henry L. Abbot, two Topographical Engineer officers, was the most extensive report on the Mississippi until that time.⁶ Full of new data and theories, the survey is a milestone in hydraulic engineering. The authors concluded that "levees only" could control the Mississippi. The Civil War prevented further construction of levees however. In fact, during the Civil War the northern armies destroyed most of the small levees while retreating southern armies often tried to clog the channel to deny its use to the enemy. By the end of the war the levees required extensive work to repair the damage. During the late 1860's and the 1870's, the federal government dredged the river extensively, restoring it as the United States' primary commercial waterway.

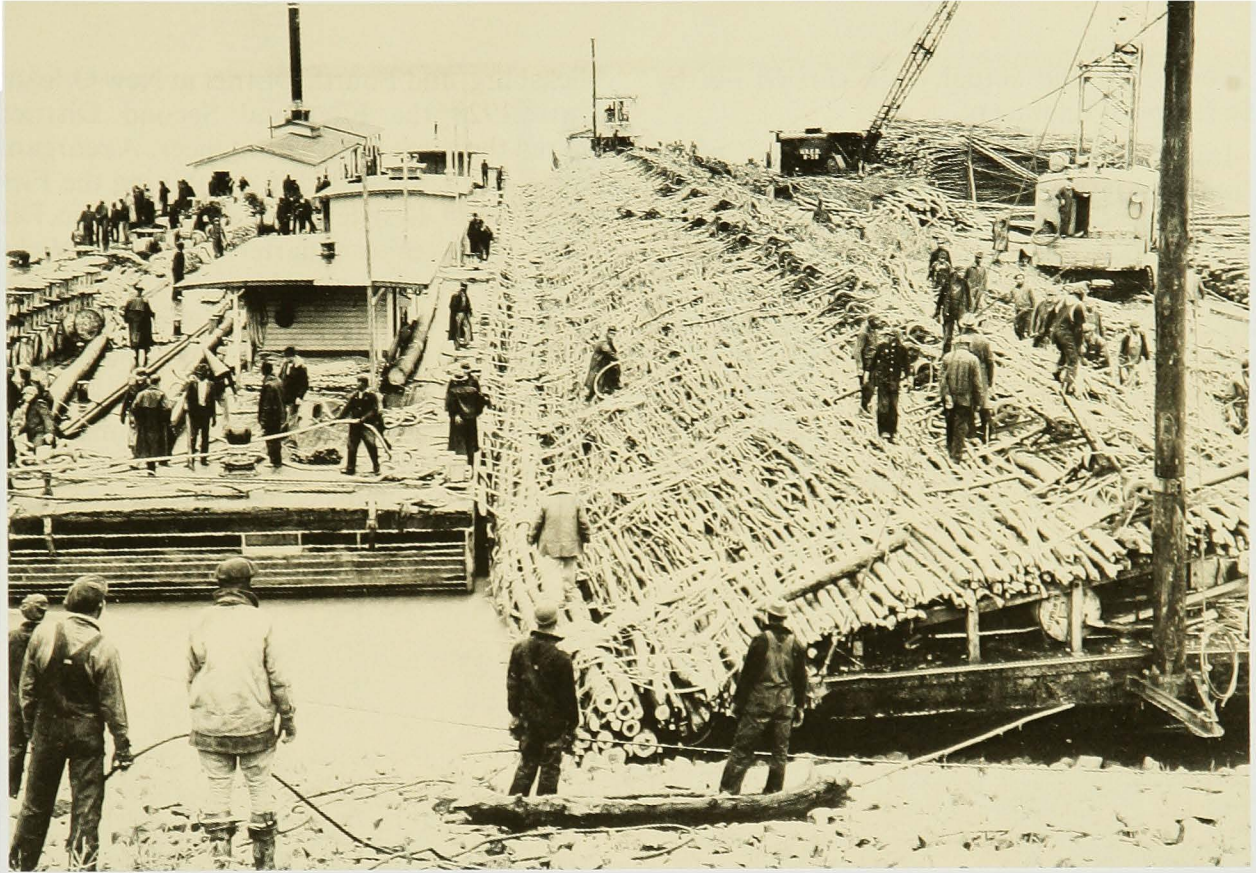
One of the most significant events in the history of the Lower Mississippi Valley took place in 1879. After the flood of 1874 Congress appropriated funds for another survey of the Mississippi and in the same year federal legislation authorized a commission to study the lower river basin. Three of the five-member

commission were Corps of Engineers officers. The Commission recommended a permanent Board of Engineers to design a comprehensive plan for improvement of the river. Debates about river improvement continued. One issue was local versus national responsibility for river improvement. Another issue was should the Corps of Engineers or some other agency be given the responsibility for navigation improvements. In 1879 Congress provided for the creation of a Mississippi River Commission.⁷ Significant improvement of the Mississippi River began with the River Commission.

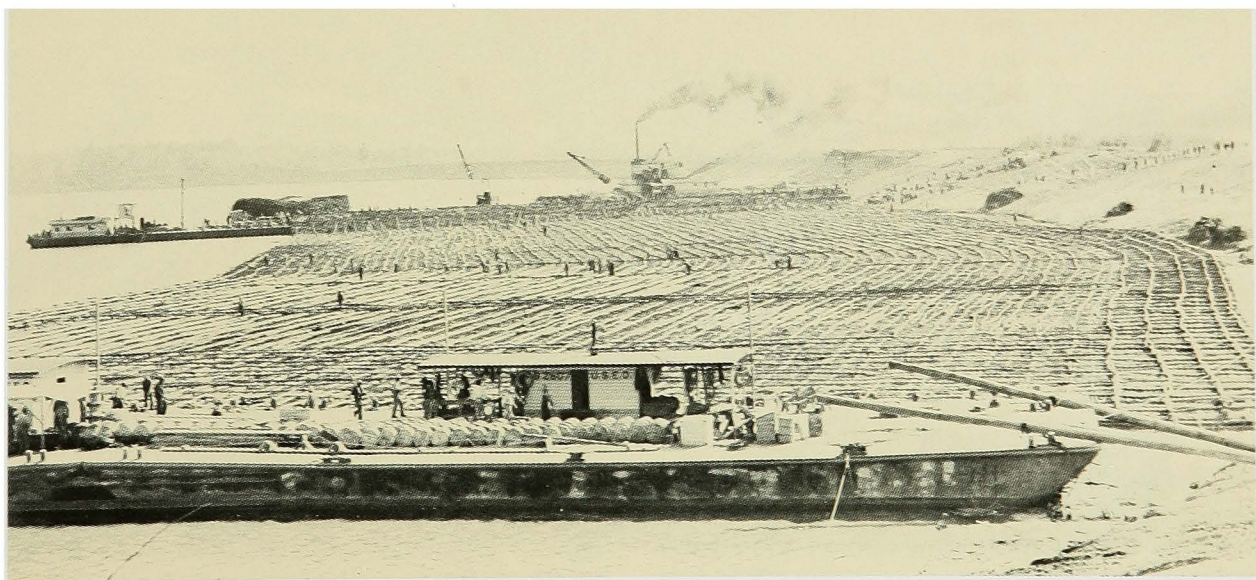
The Mississippi River Commission, as required by Congress, was composed of seven members appointed by the President and confirmed by the United States Senate. The President of the Commission and two other members had to be selected from the officers of the Corps of Engineers. One member from the U.S. Coast and Geodetic Survey and three from civilian life, including two civil engineers, completed the seven-member River Commission. General Q. A. Gillmore was appointed President of the Commission and the headquarters was located in St. Louis.⁸

The mission of the Mississippi River Commission was the improvement of navigation, protecting the river banks, and preventing disastrous floods. In the early years the River Commission could officially only use its funds to improve navigation. Levees were designed to confine the channel to predetermined locations. Water confined by levee scoured the bottom of the river resulting in improved navigation. Of course, the levees also provided much needed protection of riparian lands. Not until 1917 were there direct appropriations for flood control.

Until 1882 the River Commission planned and carried out various projects for river improvement. The River and Harbor Act of 1882 divided planning and work into separate operations. Henceforth, planning was to be the responsibility of the Mississippi River



Willow mattress plant and mooring barge being swung into position.



Woven willow mats were used for riverbank protection, October 1939.

Commission and actual work carried out by the Corps of Engineers.

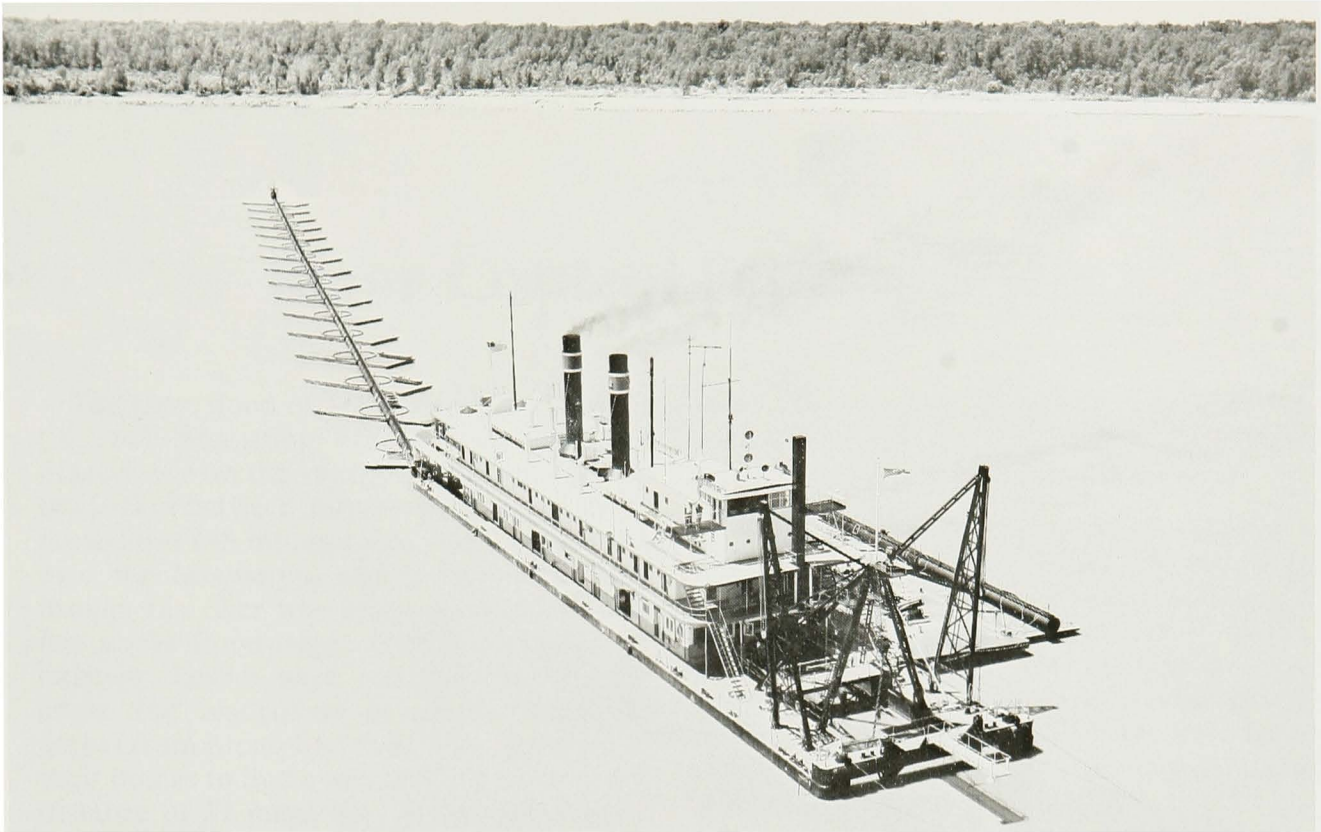
Initial meetings of the Mississippi River Commission established the headquarters at St. Louis, but the Commission's authority covered the area south of Cairo, Illinois. From Cairo the Lower Mississippi drains approximately 921,960 square miles. The Mississippi River Commission divided the river below Cairo into four Engineer Districts. First District headquarters was located in Cairo initially, but in 1885 it was moved to Memphis, Second District at Memphis, Third District at

Vicksburg, and Fourth District at New Orleans. Until 1928 the First and Second Districts shared the same District Engineer. A reorganization in 1928 resulted in combining the First and Second Districts and renaming the Districts after their headquarters: Memphis, Vicksburg, and New Orleans. Also, the Corps moved the headquarters of the Mississippi River Commission from St. Louis to Vicksburg.⁹

Navigation improvement was the major mission of the Mississippi River Commission. It was generally recognized that most of the navigation problems could be traced to bank



Severe bank caving in Memphis, July 26, 1926.



Dredge Ockerson was put into service in 1932.

caving. The Mississippi River is a meandering stream shifting its course from time to time. A study of the river has determined that the Mississippi at various times has relocated itself as many as 26 times within an area 50 miles wide.¹⁰ Meandering of the channel puts enormous pressure on the soft alluvial banks resulting in prodigious erosion. Deposits of such magnitude affect navigation of the river. The River Commission recognized that every mile of bank along the river could not be protected; it was not economically feasible. Therefore the Commission selected strategic locations for protection. Port cities along the river received the first protection. In the early years of the Commission, Memphis, which had severe problems from caving banks, benefited from this policy.

The Mississippi River Commission thought that revetment and levees would confine the Mississippi to a specific channel and the scouring action of the current would eliminate sandbars. A 10-foot channel could thus be maintained, the Commission calculated, though periodic dredging would be necessary. Early dredging had been accomplished by dragline

and bucket. In 1891, the River Commission began experimenting with hydraulic dredges which sucked the sediment to the surface where it was placed on barges to be hauled to dumping sites. Later, the development of the floating discharge pipe allowed the dredged material to be carried to a fill area or outside the channel. By 1901 the Mississippi River Commission had a fleet of nine dredges.

Two types of dredges are still in use by the Mississippi River Commission. The dustpan dredge operates just as the name implies—scooped-up sediment is deposited elsewhere by discharge pipes. Cutterhead dredges are used on harder material, but the process is essentially the same. A large drill-like cutterhead cuts through the material and it is carried by discharge pipes to other areas. Though the process has been refined over the years, dredging remains one of the most important tools in maintaining the channel of the Mississippi.

The Mississippi River Commission might have had its authority limited to navigation work forever had not several flood disasters forced Congress to open the federal treasury. The first such disaster occurred in 1882.

CHAPTER II

River Control Federal Style

The great flood of 1882 reminded people of the Lower Mississippi Valley of their continued dependence on the vagaries of nature. During the period between January and March 1882, more than 235 billion cubic yards of rain fell over the Mississippi and its tributaries. Although the river was never more than a few feet above flood stage, it did a great deal of damage. Levees were non-existent in some areas and inadequate in others. Residents across from Memphis cut holes in the roofs of their homes to find a safe and dry place. For a distance of 17 miles west of Memphis water was 4 to 11 feet deep. Crevassed levees were the norm. There were 284 crevasses with an aggregate length of 83 miles.¹ The crevasses extended almost the entire length of the Mississippi, and the water inundated an extensive area. Though no reliable figures of acreage inundated were kept, it was stated that a steamboat could have traveled from near Pine Bluff, Arkansas, to the Gulf without entering the Mississippi River.

Federal and state reluctance to provide funds for flood control compelled local residents along the river to tax themselves for levee construction through local "levee boards." Before 1900 the states of Louisiana, Mississippi, Arkansas, Missouri, and Tennessee expended more than \$64,000,000 on levee construction.

Local levee construction occurred in the area across from Memphis called the St. Francis Basin. The St. Francis Basin includes the southern part of Missouri and almost the entire length of Arkansas along the Mississippi River. In Arkansas levees were constructed during the years between 1851 and 1858. The levees averaged 3 feet in height and numerous gaps existed in the line. Along the river in Missouri levee work began as early as 1854. Approximately \$250,000 was expended prior to the great flood of 1858. Most of the levees

were destroyed by the flood. For approximately 30 years little was done to protect the citizens of eastern Arkansas and Missouri.

In 1887 the Arkansas legislature adopted a law providing for levee districts. The following year the Mississippi River Commission passed a resolution allotting \$5,000 to survey the St. Francis front to determine the best possible location for a levee. The survey was completed in the spring of 1889. Small sums were spent on levees in the area, but determined efforts did not get under way until 1893.

The Arkansas portion of the St. Francis Basin was formally organized into a levee district in February 1893. The area in Missouri was organized the following month. Almost immediately the Memphis Land and Timber Company challenged the Lower St. Francis Basin Levee District in the courts of Arkansas. The company owned large tracts of land in Mississippi County, Arkansas, and objected to the law creating the levee district and the tax imposed by the levee board. Arkansas courts ruled in favor of the levee district. Farmers of Lauderdale and Tipton counties across the river in Tennessee asked their representatives in Congress to use their influence to halt the project. They argued that the St. Francis levee would throw all the water into Tennessee and destroy their farm land. Construction of the levee continued and so did the protest for a number of years. Eventually all legal challenges were defeated and most of the people of eastern Arkansas accepted levees for flood control.

By 1897 the St. Francis levee in Arkansas was completed from some 40 miles north of Memphis to the Missouri state line. Much of the area across from Memphis was unprotected except where private land owners had constructed levees. Part of the levee was only 12 years old and had never felt the effects of



Snagboat Horatio G. Wright docked at Memphis waterfront around 1910. Note other modes of transportation.

flood waters. Ready or not, the levees experienced their first serious test in 1897.

The Mississippi River was out of its banks in March. Eye-witnesses reported that a person could travel from Memphis to Crowley's Ridge in Arkansas in a skiff, a distance of about 40 miles. Residents organized levee patrols with one man to every 3 to 5 miles. The men reported serious problems, but attempted to repair small leaks. People on the side of the river not protected by levees sometimes crossed over to cut the levee so that the flood waters would go into Arkansas rather than Tennessee. Levee cutters took a piece of barbed wire, and using it like a saw, cut a small trench to the level of the water. As the water trickled through the trench it would gradually widen to create a crevasse. By the time the crevasse was discovered the culprits were usually long gone. If they were caught by levee patrols no embarrassing questions were asked about their sudden demise.

In March 1897, flood waters covered most of Mississippi, Poinsette, Cross, St. Francis, Crittenden, and Lee counties in Arkansas. Residents on Presidents Island south of Memphis suffered in water from 1 foot to neck deep. Several people drowned there, and 12 were reported in

Marion, Arkansas. The total number of deaths was placed at 70, but no one knows whether that figure is accurate. Nearly 50 towns suffered from inundation, and approximately 60,000 people incurred property damage. In spite of the devastation no levee constructed by the Corps of Engineers had failed. Well-constructed levees proved to be effective in holding back the mighty waters of the Mississippi.

Levee districts along the Mississippi renewed the work of completing the levees. By 1904 the Mississippi River Commission had expended about \$57,000,000 on levees that reached a length of 1,500 miles. A few years later the back-to-back flood disasters of 1912 and 1913 focused attention once again on levees for flood control.

Consecutive flood years on the Mississippi are unusual. Major problems occur because the damage of the first flood has not been repaired because of lack of time. Such was the case in 1912 and 1913. In late March 1912, the river crested at 45.3 feet or about 5 feet higher than the previous high-water mark in Memphis in 1907. A second crest in April was lower, but still damaging. Crevasses occurred at Hickman, Kentucky; Caruthersville, Missouri; and at two places in the St. Francis levee across from

Memphis. Damages in west Tennessee were extensive, mostly from backwater flooding. In Memphis, the area north of the present Cook Convention Center sustained serious damage. A total of 714 houses and 25 manufacturing plants were under water at times. Total estimated damage was over \$6.5 million. More than 49,000 feet of levee under the control of the Memphis District was destroyed. Most of the destroyed levees had been constructed by private interests.

Though some levees were destroyed, others withstood the flood with surprising success. The flood of 1912 demonstrated that the levees needed to be increased in height and strength. Nevertheless, experience had shown that the states along the Mississippi were unwilling, or unable, to bear the expense. The flood of 1912 came in an election year and the problems of flooding received extensive publicity. All three major political parties voiced support for flood control. Unfortunately for the Mississippi Valley, the promises were lost in the drive to adopt the progressive program of Woodrow Wilson. Though army units were used to repair part of the flood damage of 1912, there was inadequate time to repair crevassed levees before another disastrous flood occurred the following year.

The river crested twice during the flood of 1913. The first occurred in January and the second in April. Recognizing that a major flood was on the way, the Mississippi River Commission ordered Major Edward M. Markham of the Second District to raise the levees to protect against a flood stage of 46 feet. Approximately 300 teams were put to work raising the levees of the Lower St. Francis Levee District. Again, the northern part of Memphis suffered damage. The water flooded some 20 blocks and drove more than 1,000 families from their homes.

On April 9, 1913, the river crested at Memphis at 46.1 feet, but started dropping the next day. Nevertheless, great damage resulted from the flood waters. Second Engineer

District levees suffered crevasses totaling almost 20,000 feet. Approximately 24 percent of the area subject to overflow in the District was flooded.

Soon after the flood of 1913 a group of citizens from Memphis established the Mississippi River Levee Association. By subscription the group raised \$85,000 to support a campaign for better flood control. This group and others were rewarded by the Flood Control Act of 1917. Under terms of the law, levee construction for flood control was authorized for the first time, but local authorities were required to contribute at least one-third of the cost.²

Over the years the height, grade, and section of the levees had been improved. New grades and sections were adopted in 1914 to meet the record crests of 1913 along the river. Utilizing funds authorized in the 1917 act and subsequent legislation, the Second District completed 75 percent of its levees by 1923.³

Just after the flood of 1913 a serious problem, one that had been building since 1876, threatened the harbor facilities in Memphis. In 1876 Centennial Cut-off occurred above Memphis. The adjustments to the cut-off shortened the river by some 30 miles, but caused the river to carry sediment from Hopefield Point across to the Memphis waterfront where the sediment was deposited. The District Engineer made every effort to protect Hopefield, but changes in the channel caused an eddy to form in front of Memphis. A bar was formed, and by 1904 the area of the sandbar was about 100 acres at low water. The sandbar later became very familiar to Memphis—Mud Island.⁴

Each year the sandbar increased in size threatening to leave Memphis high and dry. Many expressed the belief that the Mississippi would reclaim its creation. Nevertheless, in 1915 the unwanted addition to Memphis was still there. A project to remove the bar was completed in 1917. A diversion channel some



Mud Island flooded in 1973.



Flooding at New Madrid, Missouri, in 1937.

3,000 feet long was dredged between the bar and landing, and Wolf River was diverted through the channel. The scouring effect of the current was to erode the bar until it was washed away. Current from the channel was too weak to have an appreciable effect on the bar, but by dredging the city did have harbor facilities.⁵

Another project to remove the sandbar was completed by the Corps of Engineers in 1921. By the use of dikes, revetment, and dredging, the project was designed to throw the current of the Mississippi against the bar. However, the effort proved futile. Dynamite was then used in an attempt to loosen the bar so that the current could carry it away. Mud Island remained a permanent fixture in the Memphis harbor.⁶

For almost 50 years the Mississippi River Commission and the Corps of Engineers had tried, and with some success, to tame the turgid Mississippi. At the end of 1926 the River Commission had completed more than

120 miles of revetment and had more than 1,800 miles of projected levees under its jurisdiction that were approximately 86 percent complete. In 1927 the work received its sternest test to that time.

The flood of 1927 was an economic disaster. Though the high water of 1937 reached greater stages, it did not produce the damages of the 1927 flood. Beginning on January 1, 1927, the Mississippi rose slowly to a crest of 37.7 feet at Memphis and began a slow decline. It rose to about the same level in early February and almost remained stationary. A third crest in April resulted in the flood water being against the levees for 107 days at Memphis. The first death occurred near Ridgely, Tennessee, but it was only the first of approximately 300 fatalities. Around 137,000 buildings and homes were destroyed or damaged. Total damage was placed at \$236 million by the Mississippi River Flood Control Association. Clearly, some new actions were needed.

CHAPTER III

Mississippi River Caged; Not Tamed

Prior to 1927 the Mississippi River Commission had accepted the Humphreys and Abbot "levees only" policy of flood control. Occasionally hare-brained schemes were proposed, but quickly rejected. After serious debate, Congress passed the Flood Control Act of 1928 which abandoned the "levees only" for a more comprehensive plan. Though levees were to be enlarged and maintained, they were to be supplemented with floodways, spillways, and continuing channel improvements, including strengthening the main stem levees.

The 1928 act adopted the plan proposed by Major General Edgar Jadwin, Chief of Engineers. In the Memphis District the plan called for raising the levees along the main stem of the Mississippi and constructing a 5-mile-wide floodway from Birds Point to New Madrid in Missouri to protect the city of Cairo, Illinois.

While preparing to undertake the new projects, the Memphis District renewed its efforts to protect the Memphis harbor facilities. In 1929 revetment was placed at several places and the local Harbor Commission began grading the river banks. The area in front of Memphis had long been an eyesore. A berm bank some 60 feet wide was used to relieve the pressure on the river bank. Local authorities decided to pave the berm and in 1935 Riverside Drive was dedicated—a welcome addition to the harbor area.¹

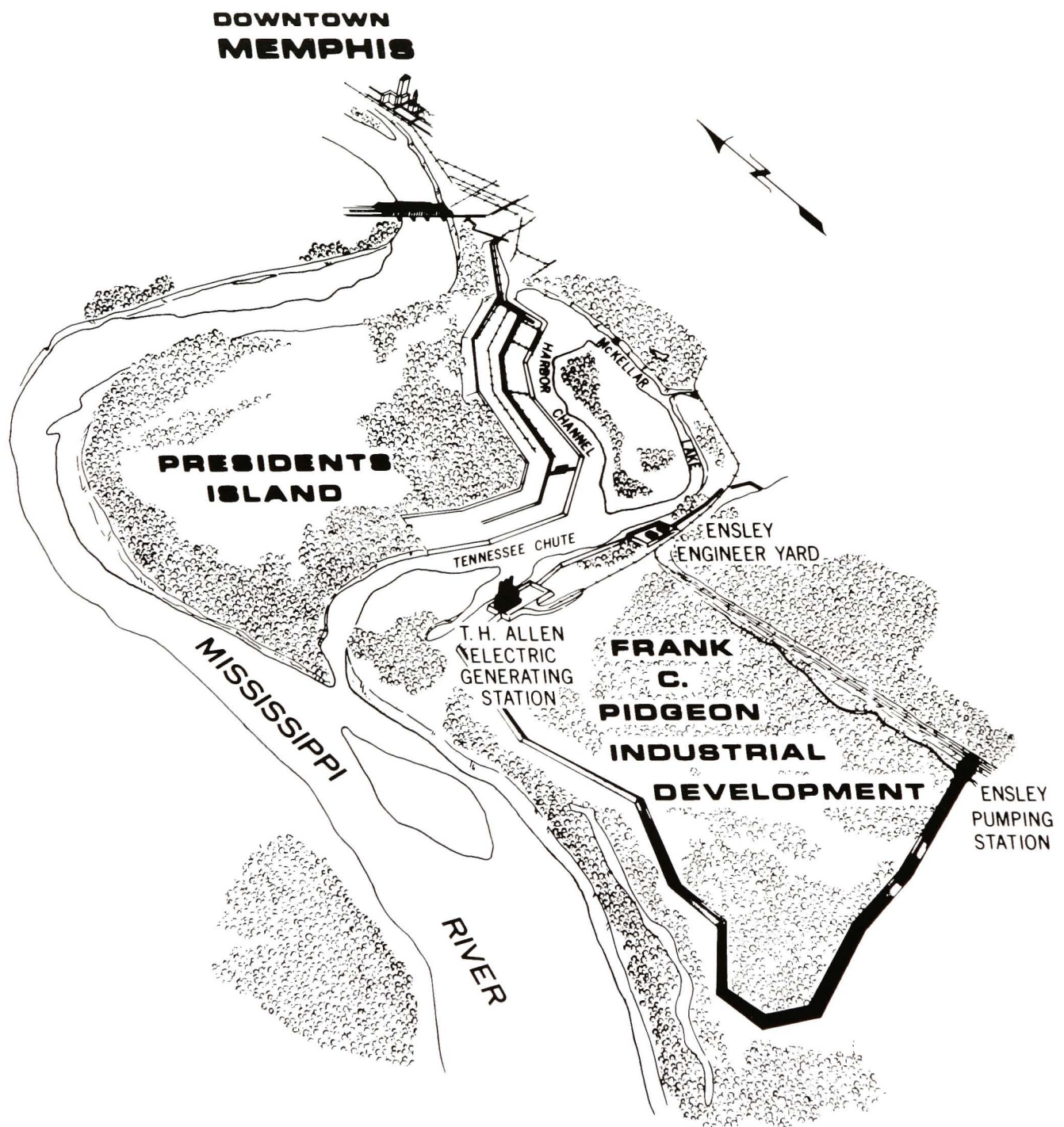
Most of the 1930's was devoted to developing the various projects authorized in the 1928 Flood Control Act. Also, the Mississippi River Commission began constructing cut-offs for channel improvement. Before 1930 the Commission had rejected all plans for artificial cut-offs. A natural cut-off at Hard Times Bend below Vicksburg in 1929 resulted in Brigadier General Thomas H. Jackson, President of the Mississippi River Commission, ordering a study of the cut-off with the view that a

program of cut-offs might be beneficial. Brigadier General Harley B. Ferguson replaced Jackson in 1932 and became the most outspoken proponent of cut-offs. The first of a series of cut-offs was completed in 1933 at Diamond Point. In 1942 the program of cut-offs came to an end with the Harding Cut-off. Though other cut-offs were studied, none were undertaken. The cut-off program resulted in a net shortening of the Mississippi River of approximately 114 miles.²

Flood control works initiated under authority of the Flood Control Act of 1928 were tested in the 1937 flood, in the truest sense a superflood. The Birds Point-New Madrid Floodway was placed in operation for the first and only time, and proved its effectiveness by reducing the stage at Cairo, Illinois, approximately 3.5 feet. District Engineer Colonel Eugene Reybold reported total damages of more than \$6.2 million, but more important was the fact that all flood control devices in the district had worked satisfactorily.

No flood control works in the Memphis District failed during the flood of 1937. Therefore, Major Daniel Noce decided to concentrate on protecting the tributaries from backwater flooding. Controlling the tributaries would cut the flow into the Mississippi and give flood protection to adjacent areas. Flood control for the city of Memphis and the St. Francis River Project are examples of this kind of work.

Flood control plans for Memphis were included in the River and Harbor Act of 1937. The project was designed to give the city protection from overflow and backwater of Wolf River and Nonconnah Creek. Floodwalls, levees, reservoirs, and pumping stations were constructed to give the city protection from a projected flood of 54.5 feet on the Memphis gage.



Memphis Harbor Project

The St. Francis River Project, authorized in the 1936 Overton Act that amended the Flood Control Act of 1928, called for a dam and reservoir, levees, floodways, a siphon, and channel improvements on the Tyronza River. The Wappapello Dam, completed in 1941, created a 625,000-acre-foot-capacity reservoir for flood protection below the dam. The area around the reservoir was transformed into a recreational complex. Another important feature of the St. Francis Project was the Marked Tree Siphon, which carries excess water over the levee and assures flood protection for the city of Marked Tree, Arkansas.

During World War II, work on the various flood control projects continued but at a reduced rate that reflected the priorities of war. Even as the war progressed and victory seemed possible, congressional committees adopted resolutions in March 1943 requesting the Chief of Engineers to review the navigational features of the Mississippi River and Tributaries Project. On February 14, 1944, the Chief of Engineers approved a report of the Mississippi River Commission that recommended modification of the project to include the authorization of a 12-foot-deep channel on the Lower Mississippi.³ Congressional debate resulted in the adoption of the Flood Control Act of December 22, 1944, which authorized a complete stabilization of the lower river to provide a 12- by 300-foot navigation channel.⁴

World War II boosted river traffic. By the end of the year, Memphis had 36 river terminals, and river commerce was increasing. On February 15, 1946, Memphis District Engineer, Colonel B. M. Harloe, held a public hearing to determine the best plan for harbor improvement at Memphis. General Max C. Tyler, President of the Mississippi River Commission, recommended the so-called Tyler Plan. The Tyler Plan was authorized by the Flood Control Act of 1946. At an initial cost of more than \$17 million, the Memphis Harbor

Project included the closing of Tennessee Chute with a dam that created additional recreational facilities. Prior to the closing of Tennessee Chute the current of the Mississippi was split by Presidents Island just south of Memphis. Part of the flow, Tennessee Chute, went to the east of Presidents Island, but most of the current went to the west of Presidents Island. Tennessee Chute was closed and the slack water then was christened McKellar Lake in honor of the senior Senator from Tennessee, Kenneth D. McKellar. Part of Tennessee Chute was dredged and then used as a slack-water harbor on the east side of Presidents Island. A levee and pumping station protected another 6,800 acres for future industrial port development.

By 1950 the flood control project for the Lower Mississippi was approximately 60 percent complete. Almost \$857 million had been expended since the adoption of the Flood Control Act of 1928. The Mississippi River Commission estimated that the expenditure had been cost effective because it had prevented about \$5 billion in flood damages, a ratio of benefits to cost of more than five to one.

The Flood Control Act of 1950 provided Memphis District additional projects. These included the Cache River Basin Project, protection from floods for Des Arc, Arkansas, and protection from backwater flooding in the St. Francis Basin. Numerous other projects did not receive approval however.

Approval of a nationwide interstate highway system resulted in a major realignment of the Mississippi in the Memphis reach. As part of the system a new bridge across the Mississippi was recommended. Construction of the bridge at the proposed location presented major navigation problems. The Corps of Engineers proposed that before a bridge could be undertaken the river in front of Memphis needed to be stabilized. After approval, the Corps of Engineers began the project in 1956. Using dredging, bank protection, and dikes, the Corps



1973 flood at Memphis.



1973 flood at Caruthersville, Missouri.

began stabilizing a 15-mile reach of the river. Engineers dredged a large western section of Mud Island and placed part of the spoil on the section of the island, raising the area 20 feet above the project flood. By the 1960's the project had progressed to a point that construction of the bridge could be started.

As the Mississippi River Commission approached its 85th year of operation, it was reported that about \$1.5 billion had been expended on controlling the Lower Mississippi. Such expenditures were great, but they had prevented \$7.2 billion in damages. The benefit-cost ratio had risen to seven to one. Still, the Corps of Engineers had to do more for floods continued to cost lives and destroy property.

In 1964 the Mississippi River Commission completed a congressionally authorized comprehensive review of the Mississippi River and Tributaries Project. The Corps recommended modifications and some were included in the 1965 River and Harbor and Flood Control Act. The act authorized a long-term plan designed to align the channel of the Mississippi into a predetermined location and hold it there through dredging, revetment, and contraction works. The purpose of the plan was to pave the way for the 12-foot channel that had been authorized several years before. To complete the project it was estimated that

nearly 780 miles of revetment needed to be placed on the banks. During the next few years channel stabilization, rather than flood control, took a majority of the budget.

By the end of 1972 the project was well underway. In Memphis District the Army Corps of Engineers had completed more than 1.6 million linear feet of revetment and 486,950 linear feet of dikes. Levees were almost completed to the adopted grade and section. Less than 90 miles of the approximately 1,175 miles of authorized levee still needed additional work.

Floods of 1973 and 1975 sorely tested the flood control structures. The Mississippi River set a record for days-out-of-bank in 1973, 62 consecutive days. Flood control structures performed magnificently, though a few privately constructed levees did fail. In all, the Mississippi River and Tributaries Project prevented damages estimated at more than \$7.2 billion. Flooding in 1975 was not as severe, but some 500 people were forced from their homes. Clearly the Corps of Engineers had played a significant part in controlling the Mississippi River during the first century of the Mississippi River Commission; but much more needed to be done. The second century of work was about to commence.



Dyersburg, Tennessee.

CHAPTER IV

Into the Second Century

The Memphis Engineer District began its second century of work on the Mississippi in 1976. Colonel Albert C. Lehman, Memphis District Engineer, accompanied the Mississippi River Commission on its annual high-water inspection trip from Cairo, Illinois, to the Head of Passes. Major General Frank P. Koisch, Mississippi River Commission President, conducted the 298th meeting of the River Commission, and he reported that the Mississippi Valley had experienced one of the calmest springs in years. Though stream flow conditions in the last quarter of 1975 had alarmed river watchers, lack of inflow from the northern tributaries produced a stage of only 42 feet at Cairo, Illinois. The normal crest stage at Cairo is about 5 feet above the crest of 1976.¹

During fiscal year 1975 the Mississippi River Commission awarded about 100 construction contracts worth about \$105 million, but when the number of contracts was added to those already under way, the total was 205 items worth \$295 million. Major General Koisch revealed that in fiscal year 1976 the Mississippi River Commission intended to award another 231 items with a value of \$157.9 million.²

According to the River Commission, the main stem levees needed additional work because the flood of 1973 indicated that the levees were not capable of carrying the project flood with the authorized freeboard. After the flood of 1973, a program to raise the levees was undertaken. By March 1976, the River Commission had awarded contracts for raising 362.9 miles of levee, and in fiscal 1976, the Commission planned to award an additional 15 miles during the transition quarter. Even with the work under way, there were more than 500 miles of levee that required raising, and another 564.3 miles of levee awaited construction.³ The President of the Mississippi River Commission reported that it required

an additional \$925 million to complete the work in a reasonable period of time.

In past years levees had demonstrated their effectiveness as a flood control measure. In subsequent years they were required to demonstrate that ability again, because in the Memphis District there is about a 50 percent chance that the Mississippi River will be out of its banks each year.⁴ There was serious flooding in 1973 and 1975 along the Lower Mississippi, but the Memphis District had more to worry about because of other rivers within the District. Major flooding often occurred on the St. Francis River in Arkansas and Missouri. Other rivers with potential flood problems in the District were the Cache, White, Black, and Tyronza rivers in Arkansas. In west Tennessee the Obion, Forked Deer, and Wolf rivers and Nonconnah Creek might cause serious flood problems. In western Kentucky several minor streams often flooded surrounding areas. The Memphis District had projects planned or under way on most of the streams, but a great deal of work remained to be done. Most of the waterways, including the Mississippi, caused serious problems for the Memphis District in 1979.

On March 6, 1979, the National Weather Service reported that snowmelt and heavy rains in the Ohio and Upper Mississippi valleys would cause the Mississippi to spill out of its banks at most locations along the lower Mississippi.⁵ The Weather Service predicted a crest of 36.5 feet for Memphis, and 54.1 feet for Cairo, Illinois. Serious problems had already developed in southeast Missouri where small levees on the Floyd Livingston and Bob Walls farms crevassed causing the Black River to flood Highway 53 south of Poplar Bluff, Missouri.⁶

Mississippi River stages north of Memphis caused the Memphis District to go into Phase I operations of its Flood Emergency Activities

Plan on March 5, 1979. Under Phase I the Corps does not take direct control of the flood-fighting operation, but provides assistance to local flood-fighting organizations, including levee patrols.⁷ The area under Phase I included the west side of the Mississippi from Cape Girardeau, Missouri, south to the Arkansas-Missouri state line, and on the east side of the Mississippi, from the Illinois levee near Mound City and Cairo, Illinois, south to the Hatchie River in west Tennessee.

Corps of Engineers personnel established headquarters in Cairo, Illinois; Caruthersville, Missouri; and the Reelfoot-Obion areas in west Tennessee to monitor flood control structures. Under Phase I operations the Memphis District provided assistance to local levee and drainage officials. Levee slides, wave wash, sandboils, and seepage were the most serious problems encountered, and Corps personnel furnished polyethylene, sandbags, and pumps to local officials to combat these minor flood problems.

Along the Mississippi, most people living inside the main stem levee began to evacuate after securing their homes and farm equipment. Farm machinery and animals were moved to higher ground, but there were always a few hardy souls that rode out the floods on the Mississippi. Most of the population of Tomato, Arkansas, moved out so that their children could attend school, because school buses could not get to the area because of flooded roads. In Caruthersville, Missouri, all of Reynolds Park was covered by the Mississippi except for a flag pole.⁸

A very serious problem developed in Cairo, Illinois, two days after Phase I operations were started. Just after noon on March 7, water began to pour out of a manhole on 10th Street near the floodwall. Local officials called Corps personnel and off-duty police and firemen to the scene, where water was pouring into the street at the rate of 6,000 to 8,000 gallons per minute. The flow of water threatened to flood

the entire city.⁹ Subterranean water pressure caused the street to buckle. Corps personnel and volunteers immediately constructed a miniature ring levee around the manhole to equalize the pressure. A diver was called to the scene and entered the flooded sewer pipe, but the tremendous water pressure prevented him from determining the cause of the problem.

Major Allan Braun, deputy district engineer, was on the scene to lead the fight. Corps personnel guessed that the cause of the flooding was a "flapgate" stuck in the open position in the Ohio River end of the sewer pipe. This would allow water from the Ohio River to flow into the city. Divers were sent into the Ohio River, and the sewer pipe was located about 50 feet below the river's surface. The divers confirmed the Engineers' theory about the stuck "flapgate."

Corps personnel began to search for a solution to the problem. The concrete sewer was about 280 feet long and varied from 48 to 72 inches in diameter, and extended under the floodwall into the Ohio River. Colonel Robert W. Lockridge, Memphis District Engineer, came to the scene. He recalled hearing about some very large rubber air bags that inflated to 72 inches. Several air bags were located in Philadelphia, and the Pentagon Operations Center allowed the use of a C-130 to bring them from Philadelphia.¹⁰

The divers descended into the river and positioned an air bag inside the sewer with a steel tube. After the air bag was positioned, air and water were pumped into the bag from a barge. The device worked and the flow into the sewer was stopped late in the afternoon of March 10. Fifty-eight cubic yards of grout was placed in the sewer and the next day an additional sixty-eight cubic yards of grout was placed, effectively sealing the sewer.¹¹ The four-day battle was won, and Mayor Allan Moss of Cairo lavishly praised the Corps for its help.¹²



Emergency work at Cairo, Illinois, 1979.

On March 8, 1979, when the flood fight in Cairo was just beginning, the Memphis District went into Phase II operations. The expansion of the flood-fighting operations was the result of a National Weather Service prediction of a stage of 54 feet at Cairo.¹³ Phase II was a part of the emergency operations activities in which the District mobilizes its forces for flood-fighting operations. The area covered by Phase II was the same as earlier announced for Phase I. For 17 days the Memphis District was mobilized to fight the flood.

Along the Mississippi, the waters began to spill into low-lying areas, and the Memphis District estimated that 200,000 acres in north-west Tennessee were under water.¹⁴ Several highways inside the main stem levees were inundated, and the small towns of Ashport and Golddust in west Tennessee were cut off by 4.5 feet of water. Most of the 250 to 300 residents of the two communities evacuated earlier except for a few that remained to protect their property from looters.

During the mobilization operations the Corps was aided by the use of two helicopters borrowed from Fort Campbell, Kentucky. The helicopters were used for daily inspection of the river banks and levees in the Memphis District's 26,000 square miles. Levee slides, wave wash, and seepage caused problems, but there were no serious threats to the main line levees. Falling river stages caused Colonel Lockridge to end the mobilization efforts, but not for long, because a second rise of the river set in.

It was a cruel joke that "Mother Nature" played on the Memphis District on April 1, 1979. Almost 9 inches of rain fell over parts of the Engineer District.¹⁵ In southeast Missouri approximately 150 residents were evacuated from low-lying areas in Portageville, Missouri, and in parts of Kennett, Missouri, water covered cars up to the windows. Flooding was reported in a dozen communities in the Boot-heel of Missouri. Many highways, including parts of Interstate 55, were inundated, and



Emergency levee at Fredricktown, Missouri, 1979.

some schools were closed because of flooding along rural roads.¹⁶

In eastern Arkansas, flash flooding forced more than 100 residents from their homes in West Memphis. Most of the refugees spent the night in a skating rink or with relatives. The Memphis District loaned the city eight heavy-duty pumps to transfer impounded water over the levees. The heavy rains caused the White, Cache, and St. Francis Rivers to go out of their banks. Drainage ditches could not take care of the runoff, and the waters spilled onto many acres of farmland. The flooding in eastern Arkansas caused the Memphis District to enter Phase I activities in the St. Francis Basin.¹⁷

Many communities in west Tennessee were struck by the flood waters. Residents of a mobile home park in north Memphis became alarmed when they saw cars and butane tanks floating past their doors, and it took almost 4 hours to rescue 82 residents of the park. In

south Memphis water covered parts of Interstate I-240; some 50 cars were damaged. Floods hit Huntington and Jackson, Tennessee, but the worst problems occurred in Trenton. Just north of Court Square a small levee crevassed on the Obion-Forked Deer River, and water up to 5 feet deep caused extensive damage. The water inundated a number of businesses and homes, and damages were placed at more than \$100,000 in the city. Numerous rural highways were closed due to the high water.¹⁸

The heavy rains caused the Mississippi to rise again, and resulted in a second flood mobilization for the Memphis District. Phase I operations were already under way in the St. Francis Basin, and Colonel Lockridge announced that Phase I operations were again under way along the Mississippi on April 12, 1979.¹⁹

A levee along the Cache River constructed of dredged material crevassed causing the river to spill into the small community of Grubbs, Arkansas. The Weather Service warned residents in low-lying areas along the Cache, White, and Black Rivers in Arkansas to remove livestock and valuable property. Governor Teasdale declared 17 counties in eastern Missouri disaster areas.

The National Weather Service predicted a stage of more than 54 feet at Cairo, which caused the Memphis District again to enter Phase II operations on April 14. The area covered by Phase II was the same as that of Phase I. The most serious problem for the Memphis District during Phase II developed at Fredericktown, Missouri, about 100 miles south of St. Louis. Heavy rains threatened a private dam holding back about 80 acres of water, and 250 residents below the dam received warnings that the dam might break at any time. Fear of a dam break caused the state of Missouri to call on Memphis District for assistance on April 14. Using Corps personnel and equipment, workers lowered the water level by enlarging the emergency spillway and deepening the main spillway. The work was

completed on April 18, and the dam pronounced safe.²¹

In southeast Missouri another serious problem developed near Caruthersville, where heavy wave wash threatened the Cottonwood Loop Levee. The levee had once been a part of the main stem levee system, but had been replaced by another levee. Local officials tried to halt the wave wash with sandbagging but failed, and on April 18 they asked for Corps of Engineers assistance. After a quick investigation, the Corps determined that it had authority to protect the levee and awarded an emergency work contract. Work began on April 20. At a cost of \$16,820, approximately 1,463 tons of riprap were placed on the levee to protect it from wave wash.²²

Many of the problems associated with the second flood mobilization occurred in eastern Arkansas. Flooding continued on the Black, White, Ouachita, Cache, and St. Francis Rivers. The Cache River again went out of its banks and flooded Grubbs, Arkansas. Estimated damage along the river was \$1,000,000.²³ Representative William Alexander toured the area and again voiced his support for the controversial Cache River Project. Senator Dale Bumpers, who had opposed the Cache River Project for years, now indicated he was ready to compromise. Residents along the river desired an accommodation that would reduce future flooding.

Falling river stages north of Memphis prompted the Memphis District to re-enter Phase I on April 24, and a few days later all mobilization operations were ended. The Mississippi River Commission reported that six states bordering the Lower Mississippi experienced flooding. Some 3,750,000 acres were flooded, and losses were more than \$57,000,000. The Commission reported that 15,000,000 acres had been protected, and the flood control structures had prevented damages estimated to be \$13 billion. A local newspaper questioned the accuracy of the

figures, but conceded that figures can never express the "intangible benefits of the peace of mind and the feeling of security," the structures provide.²⁴

During the 1979 flood, levees continued to be the main line of defense against floods. Time after time they had demonstrated their ability to hold back flood waters, but they had to be constructed properly. The levees along the Lower Mississippi and its tributaries were known around the world, and request for information about them came from many countries.²⁵ Levees were being upgraded to meet the project flow line established by the Mississippi River Commission after the floods of 1973 and 1975. The main line system consisted of more than 2,200 miles of levee along the Mississippi, and nearly 1,600 miles along the tributary streams. Each District Engineer was responsible for the levees in his District.

Responsibility for the levees sometimes caused problems for the District Engineer. In much of west Tennessee, residents pointed out that their levees were about a foot lower than those on the Arkansas and Missouri side of the river. Local officials feared that flood waters would be thrown into Tennessee, and officials of Lake County often voiced their concern over the problem. A congressional resolution in 1970 authorized an East Bank Levee Study with the view of alleviating the problem.²⁷ Public meetings were held in 1976, and a plan of study was prepared. Revisions to the project flow line delayed completion of the study. However, the Corps eventually did recommend a 6.5-mile extension of the levee to give the community of Tiptonville, Tennessee, additional protection. In 1979 Colonel William H. Reno, District Engineer, decided the study should be terminated because the primary benefits would protect an urban area, and he determined that such studies ought to be done under a separate authorization. Colonel Reno requested and received authority for a separate study that is still under way.²⁸

Most of the work of the District, as it relates to levees, is rather routine design and execution of contracts. Once levee work is completed it is turned over to local levee districts for maintenance. Nevertheless, the work becomes a little controversial at times. The Cottonwood Point Loop Levee near Caruthersville, Missouri, was the result of the construction of a new front-line levee leaving an area of about 300 acres enclosed by the loop levee. The only drainage for the area was through the old front-line levee, which was

almost impossible. During high water on the Mississippi the enclosed area could not drain, and the owner often had trouble draining the impounded water. He complained that it sometimes cost him \$8,000 to have the area drained. A complete study by the Memphis District concluded that solution to the problem was not cost effective and recommended a local solution to the problem.²⁹ Nevertheless, more than 100 years after starting work on the Mississippi, flood control remained an important task of Memphis District.

CHAPTER V

Flood Control in Arkansas

Flood control studies and projects have recently taken a majority of the Memphis District's budgetary allotments. Since the Flood Control Act of 1928, more funds have been budgeted for eastern Arkansas than any other project, or area. The only expenditure that comes close to funds expended in Arkansas is for main stem channel improvements. Most of the rivers of eastern Arkansas eventually drain into the Mississippi in the Memphis District, and many residents of the state welcome flood control projects, but others oppose them.

The strongest opposition to flood control projects revolves around the Cache River Basin Project. Congress authorized the project in the Flood Control Act of 1950. The project was designed to improve 140 miles of main channel of the Cache River, 15 miles of upper tributaries, and 77 miles of Bayou DeView. Appropriations for the project were delayed by the Korean War, and after the war Congress ordered a restudy of the project. In 1955 the U.S. Fish and Wildlife Service recommended mitigation of potential damage to wildlife. The Corps' new study, completed in 1959, recommended the project without mitigation. Between fiscal year 1967 and 1971, Congress appropriated more than \$7 million for the project's design, engineering, construction, and mitigation.¹

In the early 1970's the project became embroiled in controversy. Across the nation many Americans had become environmentally conscious. One result had been the National Environmental Policy Act of 1969. The law had a tremendous impact on Corps of Engineers activities. Under terms of the act the Engineers were required to prepare environmental impact statements on almost all of their projects. Corps personnel began preparing such a statement for the Cache River

Basin Project, but the additional work delayed the project for many months.

On August 27, 1970, Colonel Charles T. Williams, District Engineer, conducted a meeting at the District headquarters concerning the Cache River Basin Project. Most of the interested parties attended the meeting. Colonel Williams informed the gathering that he intended to award a contract for the first construction in December, and that those supporting the acquisition of mitigation lands would have to wait on specific congressional authority. He also informed the participants that the environmental impact statement was almost completed.²

The draft environmental impact statement was filed with the newly established Council on Environmental Quality on December 7, 1970.³ In the statement the Engineer District recommended the acquisition of 30,000 acres of mitigation lands. Drainage interests supported the plan as long as it did not delay construction. The District Engineer had authority and funding to initiate the project, but delayed because of the proposal for mitigation lands. In October 1971, Colonel John V. Parish, Jr., District Engineer, announced his intentions to award a contract for the first construction, but the contract was delayed by court action.

On October 6, 1971, the Environmental Defense Fund filed suit in Federal Court questioning the adequacy of the environmental impact statement. On May 12, 1972, the District Court ruled the environmental impact statement was adequate and dismissed the complaint, but the plaintiffs filed notice of appeal. In the spring and summer construction was begun near the mouth of the river, but only about 4 miles of channel work were completed in March 1973, when the Eighth Circuit Court of Appeals issued an injunction



Cache River Project.

halting the work and remanded the case to the District Court.⁴ Following another hearing in District Court, the environmental impact statement was found to be inadequate and further construction was enjoined.

A revised environmental impact statement was prepared by the Engineer District, and submitted to the Environmental Protection Agency (EPA) in November 1973 for the agency's comments. In January 1974, the EPA notified the District that the agency had strong environmental reservations relating to the effects of the project on water quality, and rated the statement as insufficient due to lack of information with which to determine the long-term effects on water quality.⁵

Two significant events related to the Cache River Project occurred in 1974. The 1974 Water Resource Development Act authorized the purchase of 30,000 acres of woodlands and the preservation of another 40,000 acres by the acquisition of easements that would prevent the land from being cleared. The final

environmental impact statement on the Cache River Project was prepared and filed with the Council on Environmental Quality on November 8, 1974. An evidentiary hearing was held in the District Court of Arkansas in November of the following year. On March 29, 1976, the injunction halting further work was lifted and the suit dismissed.⁶ In November, 1976, work commenced on another 3 miles of channel work.

After construction of the second item, the Save the Cache Committee and the Arkansas Game and Fish Commission funded a study by Dr. Sherwood M. Gagliano of Coastal Experiments, Inc., located in Baton Rouge, Louisiana. The purpose of the study was to examine alternatives to the Corps sponsored project. The Environmental Defense Fund's request for a delay in bid advertisement for the next contract pending completion of Dr. Gagliano's study was granted on February 18, 1977. On July 25, Colonel Lockridge asked the Arkansas Game and Fish Commission to

suggest that Coastal Environments, Inc., present its findings at a meeting in the District Engineer's office on August 11. At the meeting a brief outline of the study was presented by Dr. Gagliano because he had not finished the report.⁷

Several people, including Colonel Lockridge, tried to work out a compromise. Representative Alexander from Arkansas chaired a meeting of many interested people at Greers Ferry, Arkansas, on August 25, 1977, in order to inform all parties of the status of the project and to reconcile differences. The audience applauded the Corps for purchasing the first 120 acres of mitigation lands. After meeting most of the day, all parties agreed that such meetings were desirable and other meetings would be necessary. However, this meeting failed to resolve any of the issues.⁸

Lockridge scheduled another meeting for October 4 and 5 in his Memphis office. Its purpose was to review the authorized plan and to hear Coastal Environments' alternative recommendation. More than 50 people attended the meeting over the two-day period. Lockridge outlined the authorized plan and announced the purchase of 5,449 acres of mitigation lands. Gagliano recommended restoration and continued maintenance of the previously channelized stream accomplished by private interest in the upper basin. He also recommended construction of upstream reservoirs, and acquisition of a 10-year floodplain in the middle and lower basin. Acquiring the floodplain would require purchasing approximately 100,000 to 110,000 acres. The participants could agree only to a recommendation of Dr. Rex Hancock, member of the Citizens Committee to Save the Cache, that a task force be appointed to explore alternative proposals. No one from the Corps was appointed to the task force.⁹ Major General Robert C. Marshall, President of the Mississippi River Commission, said the Corps would continue work on the project, but that it would not interfere with work of the task force, because

no contracts were scheduled to be awarded before the task force's report was due on February 1, 1978.

Planning for the next item, approximately 15 miles of channel work, proceeded because the Corps had an authorized and funded project. Colonel Lockridge believed that as long as Congress had mandated a project, work must proceed until an alternate plan was adopted. He defended the project against charges that it would result in the loss of valuable floodplain forest. In 1949 the Cache floodplain contained about 310,000 acres of woodlands, but by 1973 clearing had reduced the acreage to 116,000. The reduction had occurred without the project, but with the project future generations would be assured of the preservation of 70,000 acres if the project were completed.¹⁰

The task force, composed of representatives from the EPA, U.S. Fish and Wildlife Service, Arkansas Game and Fish Commission, Arkansas Department of Pollution Control and Ecology, and a citizen's conservation representative, reported its findings on January 18, 1978. The members had reviewed six alternatives, including the Corps authorized plan, and they recommended "Plan 5." This plan included rechanneling the upper portion of the basin; a leveed floodway along the 10-year floodplain through the middle basin to the northernmost limit of backwater flooding of the White River; acquisition of 110,000 acres of fish and wildlife; and a 100-foot-wide buffer strip of natural vegetation along both sides of the main channel in the upper part of each basin.¹¹

Task force "Plan 5" was reviewed by the Memphis District and the conclusions were adverse.

1. The plan would not provide any more flood protection than the Corps plan, but it would cost approximately \$195 million and was not economically feasible.

2. The plan would require that about 30,000 acres of farmland be taken out of production.

3. The land acquisition program would affect an estimated 663 private ownerships and would displace an estimated 200.

4. The land acquisition would remove an estimated annual tax revenue of \$109,000. The Corps plan would result in the loss of only \$33,000.

5. The task force plan had little support from local residents.

6. The task force plan would delay the project 8 to 10 years.

According to Lockridge, it was time to proceed with the authorized project for there had already been some 25 studies that had considered 17 different proposals.¹²

Planning proceeded on the project for the next 15 miles of channel work, and a statement of findings for the next item was sent to the EPA in February 1978. The next month the EPA rejected the findings because construction methods less environmentally damaging were available. Memphis District reviewed the alternatives proposed by the EPA and found that the project would cost an additional \$3 to \$14 million to construct. In view of the high cost, Lockridge did not consider the plans practicable. In referring the matter to the Mississippi River Commission, he concluded that Congress and the Courts had approved the project and the EPA's action was "a blatant attempt to overrule both the Judicial and Congressional branches through administrative action."¹³ Planning for the project continued, but little could be done until the EPA issued a permit for the placement of excavated material. In the meantime, interested parties continued working toward a compromise.

Congress was unwilling to provide funding until the Arkansas congressional delegation agreed on a proposal. Senator Bumpers opposed the Corps plan and Representative

Alexander supported it. Attempting to reconcile their differences was United States Senator Kaneaster Hodges of Arkansas. Eventually, Senator Hodges brought the two men together, and they agreed on a compromise. Though the compromise was not signed, it provided for an alternate plan that required: (a) half the money appropriated must be used to purchase mitigation lands; (b) an 11-mile channel built away from the riverbed starting at the mouth of the river; (c) establish a "green belt" along a 90-mile-long section to preserve the area; (d) leveed floodways, or a bypass channel, or "mopping" of the existing channel for the middle section of the basin; and (e) in the upper basin 140 miles to be left in its present state.¹⁴

Almost at once the compromise began to fall apart. The U.S. Interior Department announced its opposition to the compromise worked out in October 1978. Alexander refused to sign the agreement until the Cache River-Bayou DeView Improvement District, the sponsoring agency, supported the compromise plan. In January 1979, the Corps notified the Arkansas congressional delegation that it was terminating all work on the project until a compromise was hammered out. Colonel Lockridge appeared before the Arkansas Game and Fish Commission on April 16, 1979, and told the Commission that all work had been halted because the opponents "seemed more interested in making noise than either flood prevention or preserving the area."¹⁵ Lockridge said the Engineers would do no further work, either in planning, construction, or mitigation. Dr. Hancock of the Citizens Committee to Save the Cache said Lockridge was "paranoid" about the Cache.¹⁶ Through February 1979, the Memphis District spent approximately \$8.1 million on the project. Seven miles of channel were completed, two bridges modified, and approximately 8,000 acres of mitigation lands purchased.¹⁷

During the spring flooding in 1979, the Hodges compromise plan was discussed again,

but nothing came of the discussion except more bitterness. Since that time others have made proposals, but they have led to only more controversy. On June 5, 1980, the Cache River-Bayou DeView Improvement District, the sponsoring agency, withdrew its support for the project. Without a sponsoring agency, the future of the project remains unsettled.

Memphis District had numerous small flood control projects at various stages of development in Arkansas. At the request of officials of Jonesboro, Arkansas, the Engineer District developed the Whiteman's Creek Flood Control Project. The Corps presented its reconnaissance report at the initial public meeting held in Jonesboro on October 30, 1980. The report indicated that improvements to Whiteman's Creek and Turtle Creek would cost approximately \$12.3 million. The District Engineer established a schedule, and at the end of 1981 the study was still under way.¹⁸

Flooding in eastern Arkansas in 1979 along the L'Anguille River resulted in a restudy of a project that was first authorized by the Flood Control Act of June 30, 1948. The project provided for improvement of the river from its mouth to mile 97.6 and improvement of 14.4 miles of tributary streams. On August 2, 1971, Colonel John Parish, the District Engineer, declared the project inactive because no local sponsoring agency had come forward to assume local responsibility for the project.¹⁹ Until 1979 little interest in the project was voiced by the residents of the river basin.

After a meeting with flood-plagued citizens of Marianna, Arkansas, in April 1979, Senator Bumpers requested the Corps of Engineers to take another look at the project. Colonel Reno, then District Engineer, informed Senator Bumpers that the best solution to the problems of flooding in the L'Anguille Basin was the formation of a local sponsoring agency for the inactive L'Anguille River Project. By December 1979, landowners in the basin had organized a Circuit-Court-approved L'Anguille

Improvement District, and Reno requested the Mississippi River Commission to reclassify the project "active." This permission was granted on January 29, 1980.²⁰

Colonel Reno notified the Mississippi River Commission of his study plans for the L'Anguille Basin, and noted that the U.S. Fish and Wildlife Service and the Arkansas Game and Fish Commission had already expressed opposition. Because of the lapse of time, the District Engineer recommended a complete re-evaluation of the project in light of environmental concerns and changes in methodology. During the remainder of the year preplanning for the project continued.

In February 1981, Colonel Reno announced initiation of advanced engineering and design studies for the L'Anguille River Project, and scheduled a public meeting for March 30, 1981, in Wynne, Arkansas.²¹ Approximately 100 people attended the meeting. Reno outlined his plan to re-evaluate the water and related land resource needs of the basin to determine the best method of flood control. Advanced engineering and design studies were expected to be completed in about 4 years. Reno expressed his determination to develop an environmentally sensitive solution. Several organizations voiced opposition to the study, including the St. Francis Wildlife Association, whose members had unanimously voted against the project.²² Nevertheless, a spirit of cooperation characterized the meeting.

The Mississippi River Commission budgeted \$150,000 for 1981 to advance the study and the Engineer District began gathering information from other agencies involved in the project. In the summer of 1981 approximately 76,000 acres were flooded by the L'Anguille River, and the Improvement District requested that the Engineers move ahead with the project. Reno informed the Improvement District that \$350,000 had been allocated for fiscal year 1982, but the Phase I report was not expected to be completed before October



Flooding in Helena, Arkansas, 1974.

1984. If scheduling was maintained, initial construction could start in 1988.²³

Flood control planning is a slow process, and sometimes frustrating. In May 1974, severe flooding occurred in West Helena, Arkansas, and on June 11, Mayor J. E. Porty of West Helena, formally requested a study of drainage in the city under Section 205 of the Flood Control Act of 1948. A Reconnaissance Report of June 1975 showed justification for additional studies. Detailed studies began in 1975, but due to lack of funding and manpower, the studies were delayed again and again. The Corps notified several interested agencies that the detailed project report was scheduled for submission to the Mississippi River Commission in June 1981. When officials of West Helena received the news, they hardly knew what to think; they had never heard of such a project. The new mayor of the city, Bob Teeter, had not been told of the project by his predecessor. Local officials indicated that financial constraints prevented them from sponsoring the project. Planning continued, however, while the officials decided what to

do. On December 30, 1980, the City Council voted not to support the project, but indicated the possibility of future participation should funds become available. Memphis District terminated the project in March 1981. The project had cost the District \$193,000, an expense that was unrecoverable.²⁴

Many communities do not understand the problems the Corps of Engineers has in developing a flood control project. Corps guidelines establish a step-by-step procedure. From reconnaissance report to construction is a time-consuming operation. Other agencies, such as the EPA, U.S. Fish and Wildlife Service, State Game and Fish Commissions, and transportation agencies have to be contacted to determine if the project affects their responsibilities. At any time the project may be delayed for months by one or more of the agencies. The delays usually result in a more economically feasible and environmentally sensitive plan, but local officials, who want flood control immediately, often fail to understand the delays.

After experiencing flooding twice in 1974 and again in 1975, officials of West Memphis, Arkansas, sought emergency relief. The Committee on Public Works of the United States Senate adopted a resolution on May 29, 1975, urging the Corps of Engineers to investigate the problems of the city.²⁵ Colonel Lehman, the District Engineer, requested \$300,000 to conduct the studies, and approval was granted. Within a few months he found the project feasible and recommended cleanout of 25 miles of Fifteen Mile and Ten Mile bayous. To speed the planning process, he recommended the work be done as a modification of the St. Francis Basin Project, as that would not require congressional approval. Because a public meeting related to a larger study of flood problems in the West Memphis vicinity had already been held, the public meeting requirement was postponed until the study reached another stage. Everything was moving along rapidly.

By March 1976, notices of study initiation, required by Corps regulations, were mailed to interested officials. The public was invited to send their comments to the District office. The draft plan of study was made public in August. The flood control project was moving with amazing speed, but the mayor of West Memphis complained of unnecessary delays.²⁶ Colonel Lockridge informed the mayor that the Mississippi River Commission had required him to develop additional data to assure the best possible degree of flood control for the city. Such delays pushed the date for the final public report back to June 1979. At a meeting with city officials in March 1978, the Engineers, despite objections from the mayor, indicated the final report would not be completed before 1981. The mayor again complained of the delays in September 1979, and Lockridge informed her that he had been directed to combine the study with a larger one that had been under way for many more years.²⁷ The task of gathering data continued, and in August 1981, the Engineers indicated the

long-awaited report was proceeding according to schedule.

Across the river from Memphis is the largest basin in the lower Mississippi Valley. St. Francis Basin is located in northwestern Arkansas and southeast Missouri. The area was once called "swamp land," but local interests began systematic drainage projects in the early 1900's. Congress in the 1920's authorized the Engineers to report on further improvements that might be needed, and the Engineers' recommendations were included in the Flood Control Act of June 15, 1936.²⁸ Major features of the project consisted of more than 400 miles of levees, three pumping stations, eight flood control and diversion structures, and one dam and reservoir. The project was designed to protect more than 1.4 million acres of land, and numerous communities in Arkansas and Missouri. Since the project's inception, the Memphis District has expended more than \$200 million on it.²⁹

The St. Francis Project experienced many delays in the 1970's, partly the result of increased environmental consciousness. The Corps, including Memphis District, changed its policies and regulations to ensure that environmental quality was given equal consideration with economic development; the District won numerous awards for its environmental designs. At the same time, several projects involving dredging and excavation were under way, or being planned, for the St. Francis Basin. To prevent adverse effects on cultural resources, Colonel Lockridge awarded a contract for an archeological survey of the entire St. Francis Basin on March 21, 1978.³⁰ Though beneficial, the survey brought a complete halt to one item of construction.

The Buffalo Creek Diversion Project was designed to relieve flooding in Craighead and Mississippi counties in northeastern Arkansas. Significant archeological sites were found in the project right-of-way in the fall of 1979. The District Engineer halted work until the

sites could be investigated. The investigation caused a 7-month delay in the project, and also cost the District \$150,000 in standby fees to keep contractors' equipment on the job.³¹ Construction resumed and plugs were left in the channel so that the archeological investigation could continue. After the investigation is completed the plugs will be removed.

Concern for the environmental impact of the project produced another delay. Flooding in 1973 caused heavy siltation of the St. Francis River near Madison, Arkansas. Difficulties in acquiring the right-of-way delayed the work until September 1977. In September 1978, the Vicksburg Office of the U.S. Fish

and Wildlife Service notified the District Engineer that an endangered species, the fat pocketbook pearly mussel (*proptera capax*), had been found in the St. Francis River. The District Engineer halted work in November 1978 to permit an investigation of the endangered species.³² The investigation was completed in the fall of 1980, and Memphis District received an opinion from the U.S. Fish and Wildlife Service that continued dredging at the site might destroy the habitat of the mussel. In June 1981, Colonel Reno canceled the project and began evaluating alternatives. The new studies were scheduled to be completed in the summer of 1982.

CHAPTER VI

Flood Control in Missouri, Illinois, and Kentucky

Flood control in the northern section of the Memphis District consisted of block drainage studies, flood control on the tributary streams, and maintenance of the main stem levees. Main stem levees were essentially complete except for upgrading and the construction of berms at various locations. Occasionally a levee slide caused problems, but they were not usually a serious threat.

One of the main areas of concern for the District was the New Madrid Floodway. The floodway was a part of the Jadwin Plan of flood control that was constructed after the flood of 1927. Stretching from Birds Point to New Madrid, Missouri, the floodway was approximately 5 miles wide and could carry 450,000 cubic feet per second. The floodway was designed to relieve flooding at Cairo, Illinois. When the Mississippi River reached a certain stage at Cairo, the levee of the floodway would be crevassed allowing part of the flow into the floodway. Since its completion it has only been used once, and that was during the flood of 1937. Because of its infrequent use, landowners inside the floodway have often advocated its abandonment, or upgrading the main stem levee enough to hold back the Mississippi without its use.

On April 9, 1965, the Senate Committee on Public Works requested a review of the New Madrid Floodway to determine the feasibility of enclosing the floodway and constructing a pumping station to carry off interior drainage in the floodway.¹ Somewhat later the same committee requested the Corps to review the project for the St. Johns Bayou area nearby. The St. Johns Bayou and New Madrid Floodway studies were combined and a review report was submitted in 1974.

The area to be protected extended from near Commerce to New Madrid, Missouri,

and included approximately 126,000 acres of farm land and about 1,800 acres of urban areas. The plan called for three pumping stations, one outlet structure, 81 miles of channel improvement, and about 14 miles of new channel.² At the urging of the U.S. Fish and Wildlife Service, the Engineers agreed to purchase 2,500 acres to mitigate the loss of fish and wildlife habitat. The Water Resources Development Act of 1976 authorized Phase I planning at an estimated project cost of nearly \$23 million.

A Phase I study is a re-evaluation of the water and related land resource needs of the area to determine if the plan recommended in the Review Report is still the best method of providing flood control. During the planning stages the original plan of flood control may be adopted or some modification may be necessary as new information is accumulated. By early 1978, the Memphis District was still in the early planning stages of its Phase I study for the St. Johns-New Madrid area.

Meanwhile, landowners in the floodway complained of perennial flooding and the cost of removing interior drainage. Because the levee at the New Madrid end of the floodway was lower, backwater flooding was a problem in the floodway. Logs and other debris were left in the floodway by the Mississippi River. One farmer complained that he had to use a caterpillar for 7 days to clear 700 acres of debris at a cost of between \$25 and \$50 per acre.³ Colonel Reno indicated that he was moving on the project as rapidly as resources permitted.

A public meeting was held in Sikeston, Missouri, on September 4, 1980, to present the Engineers' recommendations as well as several alternate plans. The recommended plan did not differ materially from the original

review report except for the inflationary effects. Memphis District estimated the project cost at \$83 million.⁴ There were a number of opponents to the mitigation plan at the public hearing. Some farmers protested that the mitigation plan would require the purchase of valuable farm lands, and others objected because it would take valuable lands off the tax rolls and reduce income for local governments. Nevertheless, a majority supported the recommended plan. In late 1981, the District Engineer, Colonel John Hatch, submitted a general design memorandum to the Mississippi River Commission, but construction was not expected until late 1984.⁵

Blocked drainage studies are an important part of the Engineers' flood control activities. Under terms of the Flood Control Act of 1946, the Chief of Engineers has discretionary authority to construct drainage facilities to correct deficient drainage problems created by levees construction. When requested, the Corps of Engineers conducts studies to determine if levees cause flooding. The studies take time and money, and often result in findings that the flood problem is not a federal responsibility. One such study concerned flooding of about 1,400 acres below Commerce, Missouri. The District determined that inadequate drainage resulting from clogged channels caused the problem. However, private interests, not Army Engineers, constructed the channels and a culvert to carry away drainage even before the Corps levee was constructed. A report was submitted to the Mississippi River Commission in May 1972, and in November 1977, the Commission determined that it did not have the authority to perform the work.⁶

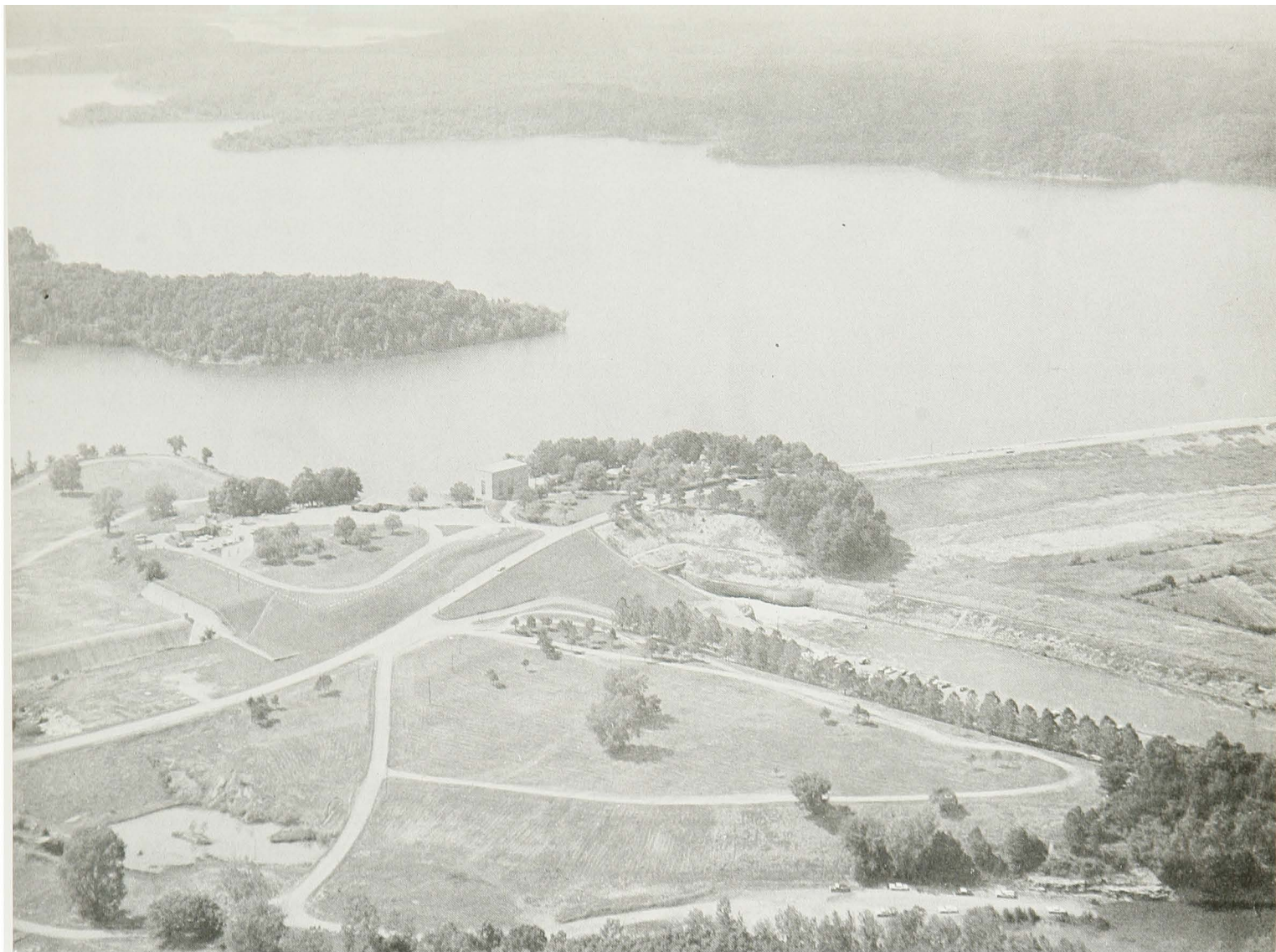
Occasionally, blocked drainage studies resulted in assistance to flood victims. The Inter-River Drainage District of Missouri requested help to prevent flooding in Butler County, Missouri. Damaging floods often occurred several times during the year due to blocked drainage. The District received authority to conduct a study, and the Engineers found that

within the area siltation caused several drainage ditches to clog. A contract was awarded to correct the problem in October 1979, and the work was completed in late 1980.⁷

Water discharged from Lake Wappapello sometimes caused flooding in southeastern Missouri. Located on the St. Francis River near Poplar Bluff, Missouri, the Wappapello Dam was completed in 1941 and was designed to impound runoff from the higher elevations. The channel below the dam was designed to carry releases from the lake up to 3,800 cubic feet per second, but since the dam was completed, releases from the lake often exceed this limit resulting in flooding of cropland adjacent to the channel.

Local residents asked the Corps of Engineers for relief from the flooding. After a study of the problem, Colonel Lockridge recommended the St. Francis River channel be realigned along a 4.5-mile reach below the dam, and snags and debris be removed from another 9 miles of channel. The improvements were designed to allow the release of 7,000 cubic feet per second from Lake Wappapello without causing serious flood problems below the dam. A public meeting was held in Dexter, Missouri, on September 1, 1977, to receive comments on the recommended plan and several alternate plans considered by the District.⁸

There was a great deal of opposition by hunters and fishing enthusiasts to the realignment of the St. Francis channel at the public meeting in Dexter, Missouri. Colonel Lockridge decided that additional studies were needed to determine if clearing and snagging the channel might accomplish the same objective. After the studies were completed, the Corps decided that clearing and snagging would solve the problem and recommended such a project to the Mississippi River Commission in June 1978. Though the Corps believed the project was environmentally sound, the District modified the project because of environmental concerns of local residents.



Wappapello Dam and Lake near Poplar Bluff, Missouri.

Another area in the upper part of the Memphis District that often had serious flood problems was the Mounds and Mound City area in extreme southern Illinois. The area is located in the narrow area near where the Ohio River enters the Mississippi. Between 1892 and 1940, 80 floods occurred in the vicinity of Mounds and Mound City.⁹ During high water on the Ohio River, the flood waters often broke across the low area, and after 1938 several flood control structures were constructed to protect the area.

Local officials of the area requested additional help with flood control because continuous flooding prevented growth of the area. The District recommended that a pumping station and several drainage channels be constructed to relieve the problems of flooding. The U.S. Fish and Wildlife Service asked that fish and wildlife habitat in the area be protected, and after a restudy of the recommended plan, Colonel Lockridge recommended that a

weir structure be made a part of the overall plan to provide habitat for fish and wildlife. The weir structure would create a pool with a surface area of about 65 acres. Local sponsors agreed to provide public access to the recreational area and to support the modifications of the project in April 1972.¹⁰ The revised general design memorandum was submitted to the Mississippi River Commission, which, in October 1978, forwarded it to the Chief of Engineers for review and approval. The Chief of Engineers approved the plan in March 1979 on the condition that the pumping station be redesigned to reduce the cost of the project. A review of the pumping station was still under way in the spring of 1982.

In western Kentucky the Memphis District has jurisdiction over flood control on a number of small streams that flow into the Mississippi River. The major flood problem relates to backwater flooding by the Mississippi. In early 1975, the mayor of Wickliffe, Kentucky,

requested the Memphis District to relieve backwater flooding on Beech Creek near the city. A reconnaissance study was completed in the fall, indicating that a feasible solution to the flood problem was possible.¹¹ The Mississippi River Commission gave approval for a more detailed study; however, funds were not appropriated until 1977. The Corps proceeded to develop several options, which were ready for review in March 1978. However, the politicians were anxious to get the project under way. In April 1979, United States Senator Wendell H. Ford of Kentucky complained that "It [was] inexcusable to keep such a simple project on the back burner for so long."¹²

Memphis District developed four different plans. They included floodplain evacuation, a levee or floodwall to protect the city, a ring levee, and a floodproofing plan that would require that each structure in the floodplain be raised so that the floor level would be above the project flood. In late 1979, Colonel Reno, District Engineer, rejected the structural measures because they were not economically feasible. At the same time he suggested that the District might be able to participate in plans for floodplain evacuation, and outlined two such plans. The first plan required the acquisition and removal of all structures, moving the residents, and converting the area into a park at a cost of approximately \$1.2 million. A second plan contemplated the purchase of all conventional structures within the floodplain and relocation of all occupants. Mobile homes would be allowed in the floodplain, but would be raised to an elevation of 1 foot above the project flood. Estimated cost of the second plan was about \$1,000,000. Under either plan, local officials were required to contribute 20 percent of the costs. Mayor T. A. Juett, Jr., notified Colonel Reno that the city could not provide the local cost unless the city could obtain a grant for the city's share. Juett indicated that obtaining a grant was being investigated. In the meantime, Reno

initiated a survey questionnaire of the flood zone to aid the District in completing the plans.

The area south of Wickliffe, Kentucky, suffered from backwater flooding from the Mississippi River. The culprit was the 59-mile-long Obion Creek. Flowing northwestward across the western Kentucky, the stream flows into the Mississippi just north of Hickman, Kentucky. Bayou de Chien joins the Mississippi at the same point. Approximately 535 square miles are drained by the two streams. Backwater flooding usually was confined to the lower 19 miles of the stream, and flooding occurred about every third year in a 50-square-mile area.¹³

Local officials often asked for assistance with their flood problem. The Flood Control Act of 1965 authorized flood control for Obion Creek. Memphis District began studies that resulted in a general design memorandum being completed in June 1971. The plan of improvement consisted of enlarging Obion Creek near Pryorsburg, Kentucky, downstream for nearly 32 miles. For the next 4.6 miles a new channel would be excavated, which would empty water into Bayou de Chien. A 1.5-mile section of the bayou would also be enlarged just above where it entered the Mississippi. When completed the project would protect about 30,000 acres from flooding.

The U.S. Fish and Wildlife Service expressed its concerns to the District in January 1971 about the plan's effect on fish and wildlife habitat.¹⁴ Because of Fish and Wildlife Service reservations, the Office, Chief of Engineers, returned the general design memorandum to the District for review with instructions to determine if fish and wildlife mitigation was needed. The Fish and Wildlife Service recommended that nearly 10,000 acres be set aside to mitigate the losses, though they submitted no data to justify the acreage. Because of this additional study requirement, the project was delayed. Colonel Lehman eventually recom-



Flooding in west Tennessee, 1975.

mended purchase of 6,000 acres to mitigate project losses.

In February 1975, the Corps released a draft environmental impact statement that immediately upset the EPA. A part of the project called for an 8-mile-long continuous levee of excavated material below mile 9 of Obion Creek. The EPA thought the report inadequate because regulations required that the Engineers identify the acreage of wetlands destroyed by dredged material. Other critical comments related to the failure of the Engineers to identify the acreage that might be cleared for cropland because of improved drainage.¹⁵

The general design memorandum, environmental impact statement, and mitigation report were sent to the Mississippi River Commission in March 1976 and forwarded to the Chief of Engineers in May. Colonel Lockridge sent out a public notice on July 28, 1976, to comply with Sections 313 and 404 of the Federal Water Pollution Control Act. Regulations required a permit to place dredged material in wetlands. The document stated that the Corps intended to place dredged material on a small section of wetlands and that any legitimate agency could request a public hearing on such matters. The Western Kentucky Wetlands Preservation Committee requested a public hearing in the fall of 1976.

The Environmental Defense Fund expressed strong opposition to the project for a number

of reasons. First, the placement of dredged material would result in the loss of wetland habitat. Second, less environmentally damaging alternatives were available. Third, it was the responsibility of the Corps to restore and maintain the chemical, physical, and biological integrity of the nation's waters.¹⁶ The organization joined the Western Kentucky Wetlands Preservation Committee in requesting a public hearing and calling for a halt to the project until all concerns could be addressed. In response, the Corps conducted a public hearing in February 1977 at Clinton, Kentucky.

The hearing resulted in the Corps of Engineers agreeing to study the effects of placements of dredged material. A 4-month-long study determined that 5,850 acres of wetlands existed in the Obion Creek Basin, and the project was redesigned to confine the dumping of dredged material to only 185 acres of wetlands. The new study resolved one problem, but other objections delayed the project again.

On May 24, 1977, President Jimmy Carter issued Executive Orders 11988 and 11990. The orders required that federal agencies provide leadership to preserve and enhance the natural and beneficial values served by wetlands and floodplains, and to minimize the destruction, loss, or degradation, of wetlands.¹⁷ The EPA and the U.S. Fish and Wildlife Service believed that the project violated the two Executive Orders, and until the matter could be resolved, the project remained in abeyance.

To try and resolve the difference with the EPA, Colonel Lockridge met with EPA officials on September 29, 1977. The two agencies agreed to re-evaluate the plans concerning placement of dredged material. In October, Lockridge modified the project again to eliminate the placement of dredged materials from all the remaining 119 acres above the Obion Creek mouth at an additional cost of about \$250,000.¹⁸ He notified the EPA that he had complied with all regulations in planning the project, but the EPA still objected to the project. Because a stalemate with EPA developed, Lockridge submitted the problem to the Mississippi River Commission for resolution.

The final environmental impact statement was filed with the EPA on January 27, 1978, but construction was further delayed while various agencies reviewed the report. Again, the Fish and Wildlife Service and EPA objected to the project because they claimed it did not comply with the two Executive Orders. Discussions in Washington between the EPA and Lieutenant General John W. Morris, Chief of Engineers, led to a compromise on June 28, 1978. The compromise included:

1. Acquisition of 6,000 acres of mitigation lands to take place concurrently with construction.
2. Elimination of economic benefits associated with clearing of 4,200 acres and preserving the acreage instead.

3. To the maximum extent possible construction would utilize natural channels, oxbows, riffles, and other natural characteristics.¹⁹

The first part of the agreement required congressional authorization, which delayed the project again.

A supplement to the final environmental impact statement was prepared and submitted to the EPA on October 16, 1978. The purpose of the statement was to address the comments received on the earlier statement, and to deal with the problem of placement of dredged material. In April 1979, EPA reported the supplement inadequate and requested the compromise agreement be made a part of any report submitted to Congress, and Colonel Lockridge complied with the request. Much of the opposition centered on the projected loss of 4,200 acres of wetlands that would be cleared for farmland once the project was completed. In September 1980, Lieutenant General Morris agreed to include the 4,200 acres in the total 6,000 acres of mitigation lands that were to be acquired.²⁰ The mitigation report continued to be reviewed by the Chief of Engineers, and the project could not be initiated until the mitigation was authorized by Congress. The future of the West Kentucky Tributaries Project remains uncertain.

CHAPTER VII

Flood Control in Tennessee

Many communities are unaware that the District Engineer, with approval from higher authority, can initiate small flood control projects under the continuing authorities program. Authority for small flood control projects is derived from two flood control laws. Section 205 of the Flood Control Act of 1948 provides discretionary authority for the Chief of Engineers to expend up to \$2 million for stream improvement if the work is in the interest of flood control. Section 208 of the 1954 Flood Control Act provides authority to the Chief of Engineers for removal of snags, drift, and other debris and for clearing and straightening of channels. Each project is limited to a federal cost of not more than \$250,000.¹

Both flood control laws require that a local government organization must request a study of a local flood problem. Once a request is received, the District Engineer initiates a reconnaissance report to determine if there is an economically feasible solution to the flood problem. Each project must be complete within itself, be economically justified, and the sponsoring organization must be able to provide all right-of-way and maintain the project after completion. If the reconnaissance report determines a solution to the problem is practical, a feasibility study is undertaken if there is a local sponsor. Should the reconnaissance report indicate the project is not economically feasible, no further studies are undertaken. Occasionally the reconnaissance report indicates that other agencies, such as the Soil Conservation Service, already has flood control plans under way, and there is no need for further study by the Engineers.

The city of Huntington, Tennessee, requested assistance to prevent flooding along an unnamed creek that flowed through the city. Everytime there was sustained rainfall the creek went out of its banks and flooded part

of the city. A reconnaissance report indicated a solution was possible. A May 1975 public hearing held in the city indicated public support for the project. However, the project was caught in a funding squeeze. Each year the Congress provides funding for such projects, and when the funds are exhausted there can be no further construction. The city of Huntington's project was caught in a backlog because of a lack of funds.²

By August 1976, the detailed project report for the city was completed and submitted to the Office, Chief of Engineers, for approval. The District Engineer, Colonel Lockridge, requested that officials of Huntington provide assurances of local cooperation, and the city responded that it could fund its share of the project. In September 1976, the Corps notified city officials that the Chief of Engineers had approved the project. The project called for 1,110 feet of channel enlargement; 1,870 feet of concrete wall channel; and 3,320 feet of grouted riprap channel. Only one firm bid on the project, however, and its bid was more than 28 percent above the Corps of Engineers estimated cost. Government regulations prohibit awarding of contracts which exceed the estimate by more than 25 percent unless it is determined that an error exists in the government estimate. The project was readvertised and, in September 1979, a new bid came within the government estimate. The contract was awarded, and the completed project was turned over to local authorities in a dedication ceremony on October 9, 1981.³

At times the Engineer District expends funds in large amounts only to have the local sponsor refuse to fund its share. The Flood Control Act of 1965 authorized a flood control plan for the Mud Lake and Blue Bank Bayou areas near Ridgely, Tennessee. Studies were initiated that determined that channel work and a pumping station would solve the problem of

flooding. By May 1976, the Mud Lake Project was in the Phase I Advanced Engineering and Design Program. A request for a study of nearby Blue Bank Bayou resulted in combining the two studies. A new public hearing was held in Tiptonville, Tennessee, on November 30, 1976.⁴ The general design memorandum required a revision of the benefit-cost ratio. New studies indicated that the benefit-cost ratio was only marginal and that structural changes were needed in the pumping station to reduce the project cost. However, the design changes did not sacrifice quality. Most of the changes related to the building that was to house the pumps.

Still, the cost of the project caused the local sponsor, Lake County Levee and Drainage District, to have second thoughts about the project. Local costs for lands and damages were estimated at \$135,000, and relocations would cost approximately \$112,000. The Mud Lake Project required \$247,000 in local funding. The cost of running the pumping station would be \$37,000 per year. The Levee and Drainage District reported that they were incapable of funding the local share, and asked for a waiver of local responsibility. This the Corps of Engineers had no authority to do.⁵ In the spring of 1981, the Levee and Drainage District decided to seek congressional authority to waive the local responsibility except for maintenance cost. At the present time the project is awaiting congressional action.

In addition to the problems encountered by sponsors unable to provide local assurances, the Memphis District became involved in a bitter controversy over the West Tennessee Tributaries Project and the "404" permit program. On the surface neither appears to be related, but they caused several District Engineers enormous problems.

Section 404 of the Federal Water Pollution Control Act Amendments of 1972 assigned to the Corps of Engineers the responsibility of

issuing permits to dump dredged or fill material into the waters and wetlands.⁶ Anyone planning to conduct activities set out in the law is required to apply for a permit from the District Engineer. If there are no objections, the permit is issued. The Section 404 program contributed to halting one of the larger projects under way by the Memphis Engineer District—the West Tennessee Tributaries Project.

Extensive channelization of the west Tennessee tributaries took place in the 1920's and 1930's. The Flood Control Act of 1948 authorized flood control for the Mississippi tributaries in west Tennessee. Tributary streams of the Mississippi in northwest Tennessee drain approximately 4,500 square miles. The Obion and Forked Deer rivers and their tributaries comprise the basin. Flood control for the two rivers included realignment of about 118 miles of main stem and tributaries on the Obion and about 106 miles of the Forked Deer system. Construction began in 1961 and was progressing until conservationists became alarmed at the loss of wildlife habitat.

On April 23, 1970, four duck hunters, led by Clark Akers, filed suit in the District Court alleging the flood control project was harmful to fish and wildlife resources, and violated the regulations of the National Environmental Protection Act. Several environmental groups subsequently joined the suit. Work continued on the project while the suit was being heard. The project was about 32 percent complete when on March 2, 1973, the District Court ruled that the environmental impact statement was inadequate and prohibited additional construction. The Court directed the Corps of Engineers to submit a revised environmental impact statement.⁷

Work on the West Tennessee Tributaries Project continued, but without Corps of Engineers participation. The Tennessee Legislature had created the Obion-Forked Deer Basin Authority to continue the project that had been halted by the District Court. No

environmental impact statement was necessary because no federal funds were involved. Eventually, the authority's charter was expanded to permit a program for the comprehensive development of the water and related resources in a 14-county area of west Tennessee.⁸ The Basin Authority began operations in July 1973, and within a year the agency had completed 37 miles of channel work.

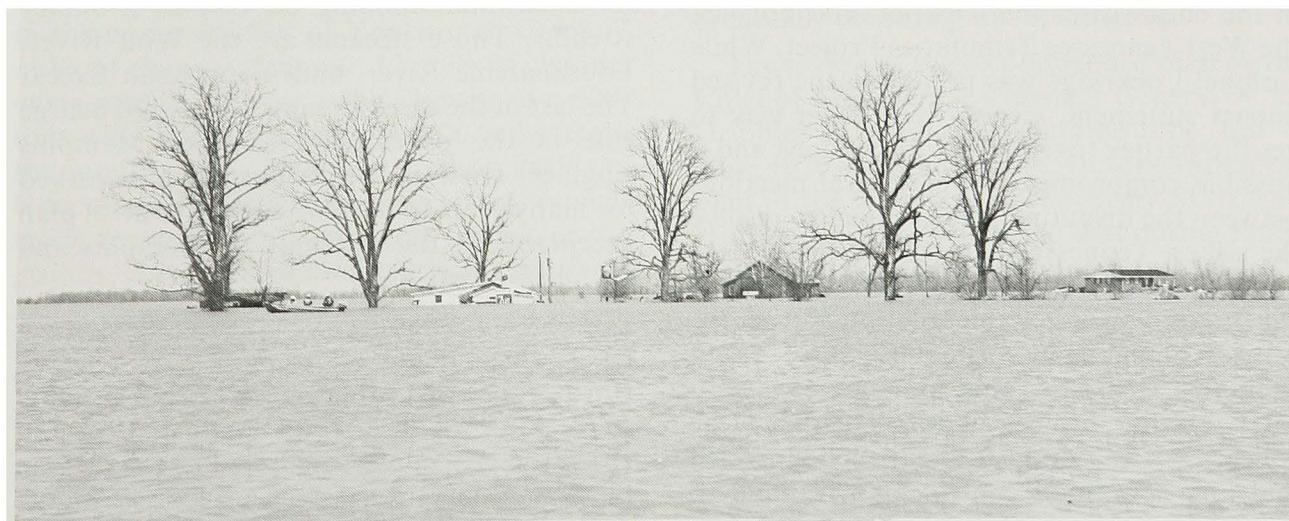
Memphis District began working on the revised impact statement, and by the summer of 1975 the document was completed. On September 2, 1975, the government filed a motion to dissolve the injunction. There followed a protracted period of litigation lasting almost 3 years with both sides filing briefs and motions. In the meantime, other parts of the project proceeded.

The injunction did not cover the purchase of mitigation lands. The Water Resources Development Act of 1974 had provided for the acquisition of 32,000 acres of land to mitigate fish and wildlife losses.⁹ Initial negotiations for mitigation lands followed procedures established earlier of purchasing only from willing sellers. Many farmers in the area bitterly opposed the mitigation plans for it

included many acres of productive farmland. Nevertheless, the District Engineer was in the process of acquiring 125 parcels and in June 1975, Colonel Lehman announced the purchase of the first 40 acres.¹⁰

The Corps of Engineers began to implement the Section 404 permit program, and in February 1976, the Obion-Forked Deer Basin Authority applied for a permit on its work, but because of the litigation, the Corps of Engineers refused to issue the permit. With limited funds the Basin Authority continued to operate, but it became involved in a heated controversy with the EPA. In August 1977, the EPA ordered the Basin Authority shut down under penalty of \$10,000 a day fine and possible jail term.¹¹ Over the next several months the threat of a shutdown was removed after several conferences in Nashville and Washington. Near the end of 1978 the Basin Authority requested "404" permits in areas that required dredged material to be placed in wetlands, and the permits became involved in the original lawsuit that had halted the Corps sponsored project.

On January 27, 1978, the District Court issued its ruling on the revised environmental



Flooded areas in the West Tennessee Tributaries Project, 1975.

impact statement, declaring it did not meet National EPA standards. The government filed notice of appeal, but it was later withdrawn. The injunction issued in 1973 prohibiting further work remained in force. Four additional motions were filed by the plaintiffs. The plaintiffs asked the Court to prohibit issuance of Section 404 permits in the project area. In February 1978, Colonel Lockridge held a public hearing on Obion-Forked Deer Basin Authority's request for seven permits, and at the hearing several environmental groups and agencies opposed the issue of the permits.

On September 29, 1978, the National Ecological Foundation filed suit in District Court in Nashville, Tennessee, contending that the Corps administration of the permit program for the West Tennessee Tributaries Project had not been proper. A change of venue was granted, and the case was transferred to the District Court at Memphis. No injunction halting the permit program was issued, and the processing of permits continued.¹²

The District Court's ruling the previous January had directed the Engineers to revise the environmental impact statement to determine the cumulative effect of Corps projects in the entire Memphis District, and not just the West Tennessee Tributaries Project. While Colonel Lockridge was preparing the revised impact statement, efforts were under way to get the parties together for discussions and a possible compromise. After several meetings between the disputing parties failed to resolve the issues, Tennessee Governor Lamar Alexander appointed a task force in the spring of 1981 to find an acceptable solution and get the project going again. The task force asked Memphis District to find innovative ways to carry on the project and still assuage the concerns of the opposition. It recommended that any new flood control plan respond to four major concerns: (a) economic feasibility;

(b) restoration of floodplain integrity; (c) reduction of soil erosion; and (d) improvement of water quality.¹³

After extensive investigation, the new District Engineer, Colonel Reno, recommended a plan that would achieve the task force's goals. It included: (a) channel enlargement from one side only; (b) construction of drop structures or riprapped outfalls at locations where side drains enter at higher elevations; (c) lateral drainage ditches to permit drainage of low areas; (d) reestablishment of abandoned bendways; and (e) easements that would prevent clearing and conversion of woodlands.¹⁴ The Corps chose a 12-mile reach of the west Tennessee tributaries for special study to address the four issues. The solution was praised by Governor Alexander. In the meantime, negotiations were started with the view of reaching a compromise that would result in the suit being dropped. Colonel Reno participated in the discussions, and in March 1982, the disputing parties were close to an agreement.

Flood control in west Tennessee included the area surrounding the District headquarters. Memphis is located high on bluffs and there is no serious threat from the Mississippi except for backwater flooding on various tributary streams. Those streams are the Wolf River, Loosahatchie River, and Nonconnah Creek. The last of the three streams has played a large role in the development of the Memphis Engineer District, for the District has worked for many years to develop a flood control plan acceptable to the residents of Memphis and the surrounding area.

Backwater flooding often caused Nonconnah Creek to spill out of its banks, or a heavy storm would make the laconic stream a raging river. After the disastrous floods of 1912 and 1913, the city constructed small levees along the banks, but they proved to be inadequate. A Corps of Engineers plan for the stream was

included in the River and Harbor Act of 1937 that resulted in the construction of approximately 22,000 feet of levee extending from the mouth of the stream.

The Senate Committee on Public Works in 1970 and 1972 requested the Corps of Engineers to investigate flood control for Nonconnah Creek.¹⁵ A local sponsor for the project, Chickasaw Basin Authority, was created by the state legislature in May 1971.

In initial meetings with local sponsors, the District Engineer, Colonel Parish, indicated that a plan with channel cleanout and a reservoir appeared to be the best solution to flood problems related to Nonconnah Creek. The Chickasaw Basin Authority began to acquire lands in the area of the proposed lake, but it ran into trouble. A condemnation suit against property owners in the area resulted in the Circuit Court declaring the Basin Authority unconstitutional on grounds that the tax levied by the Basin Authority did not apply to the entire county. The objection was later removed by the Tennessee state legislature.¹⁶

Though approved by the Chickasaw Basin Authority in 1972, the Engineers' plan quickly ran into opposition. The project features included construction of a 3,280-acre reservoir in the upper reaches of Nonconnah Creek, 7 miles of channel cleanout, 12 miles of channel enlargement, and the establishment of a 600-foot-wide greenway extending 20 miles from the mouth. The opposition, calling itself the Nonconnah Improvement Association, immediately focused on the reservoir feature of the project. Opponents termed the lake a mudhole and a nuisance.¹⁷ The Basin Authority began to feel pressure from the opponents, and though still supporting the recommended plan, they asked the District Engineer to study channelization as an alternative. Colonel Lehman replied that channelization alone could not be economically justified.

In spite of the opposition to the lake plan, Lehman forwarded the report to the Mississippi River Commission in the fall of 1973 for approval. In January 1974, the plan was sent to the Chief of Engineers for his review. During that review, Lehman was asked to restudy the plan and give additional consideration to the reservoir and recreational features of the plan. The Office, Chief of Engineers, had a number of concerns related to potential water quality problems, shallowness of the lake, mosquito control, and pollution problems. If the problems were considered, the benefits assigned to the lake might be less than estimated. Also, Governor Winfield Dunn recommended that the project be implemented for flood control, but the reservoir and recreational features be delayed to give the state time to determine its share of the funding.

In the meantime, the Chickasaw Basin Authority became involved in another lawsuit that attacked its land acquisition policies. Opponents of the project filed suit in Chancery Court in Memphis claiming the Basin Authority was acting unconstitutionally by acquiring lands when there was no authorized plan.¹⁹ In July 1975, the Chancery Court declared the Chickasaw Basin Authority unconstitutional and enjoined it from further land purchases; eventually the ruling was overturned.

The review of the recommended plan by the Chief of Engineers, Lieutenant General W. C. Gribble, Jr., took considerable time, but in June 1976, he approved it. In forwarding the plan to the Secretary of the Army Martin R. Hoffman, Gribble indicated that during Phase I studies the District Engineer would make another study of the reservoir feature to determine if it were still feasible. The 1976 Water Resources Development Act authorized Phase I studies for the Nonconnah Project, which would determine if the recommended plan was the best method of flood control or if some modifications were needed.²⁰ No funds

were appropriated for the study, and the first funds did not become available until late 1977. On December 28, 1977, Colonel Lockridge sent out notices of the initiation of Phase I studies. Lockridge estimated that it would take 2 years to complete the study.

While the study was progressing, the Chickasaw Basin Authority recommended that the reservoir be eliminated in favor of other methods of flood control. The Phase I study was delayed, and by May 1980, it was only 60 percent complete. Colonel Reno indicated that he was considering three alternatives, including reservoir only, channel improvements, and a combination of reservoir and channel work.

At a May 14, 1981, public meeting serious opposition to the District's plan developed.

Another public hearing was held on August 21 to review comments received earlier. After reviewing the comments, Colonel John F. Hatch, Jr., District Engineer, abandoned the reservoir plan in favor of channelization. He recommended enlargement of the channel from the mouth of the creek to St. John's Creek, a distance of about 12 miles, and clearing debris from another 6 miles of the channel. Recreational features included 15 miles of bike trail, a 47-acre natural area, and about 4 miles of nature trail.²¹ In February 1982, the Mississippi River Commission approved the project, and forwarded it to the Chief of Engineers for review. After approval by the Chief of Engineers and authorization by Congress, the project is expected to take 5 years to construct.

CHAPTER VIII

Navigation

Navigation of the Mississippi River has moved from the Indian dugout to the *Miss Kae-D* pushing probably the largest tow ever seen on the river. The tow's configuration was nine barges across and eight deep, a total of 72 barges. Surface area of the tow was 12.7 acres. Total capacity of the 72 barges was 113,400 net tons. To carry the same cargo, it would take 1,152 boxcars stretching to a length of more than 13 miles or 4,320 tractor-trailers.¹ It was the mission of the Corps of Engineers to keep navigation open for both large and small vessels. By Congressional mandate, the Corps is charged with keeping a 9- by 300-foot channel open at all times.

Keeping a navigable channel is important for economic reasons, because approximately 413,000,000 tons of cargo pass through the lower Mississippi each year. The Corps of Engineers uses several methods to keep the channel open, but the most important ones are dredging, revetment, and dikes. All are expensive operations, and consume a large share of the Engineer District's budget each year.

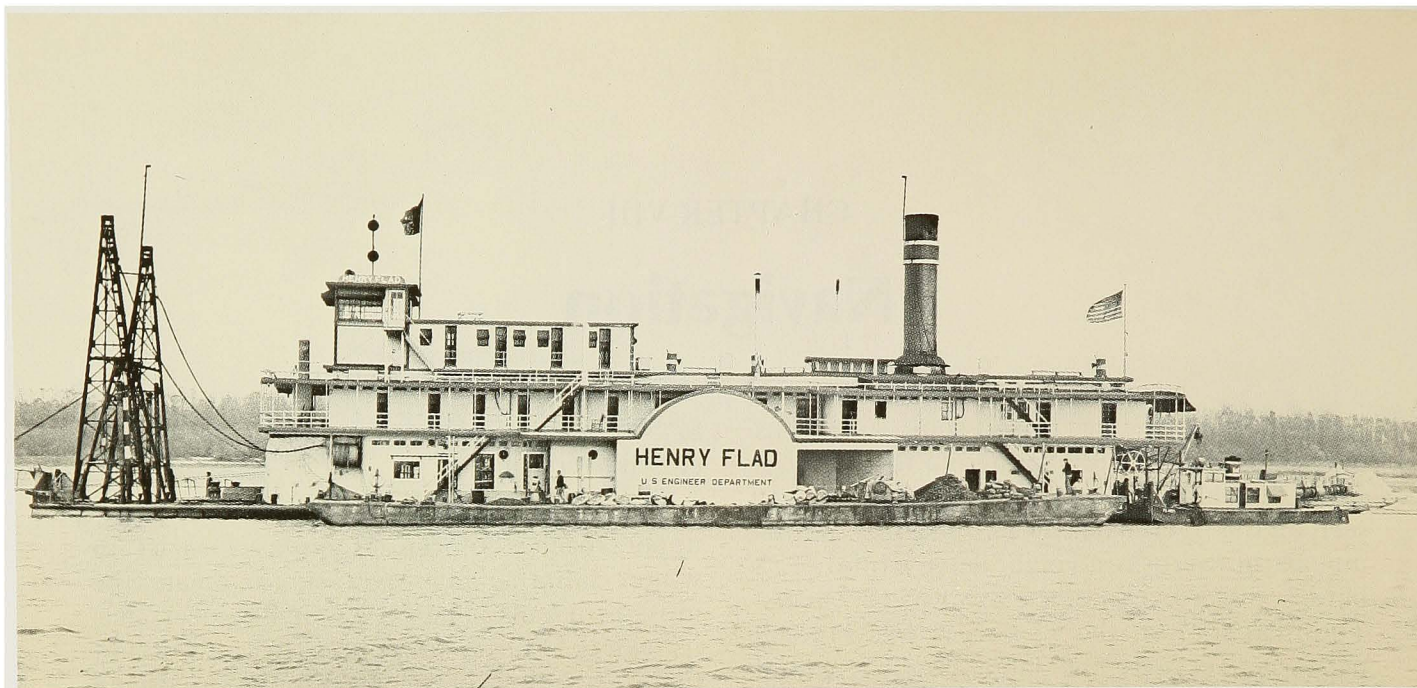
Dredging consists of two types of operations. Maintenance dredging is used to keep the channel open in troublesome locations, where shifting currents drop sediment into navigation channels. It is an annual exercise for the Corps of Engineers. Improvement dredging is used to realign a reach of the river into a desired location and keep it there. Both operations are very costly. Operating expenses of a dredge average about \$20,000 per day. The typical work force during the dredging season is a 58-man crew for each dredge. A dredge is operated 24 hours a day with crew members working two 6-hour shifts per day. A dredge uses about 150 barrels of crude oil a day for fuel, each barrel containing about 42 gallons.² Towboat operators know the importance of a navigable channel, for they can lose up to

\$2,500 an hour when grounded or the river is closed to traffic.

Though ice gorges can close the river in the upper reaches of the Memphis District in winter months, low river stages create the most problems. The Corps of Engineers has its own facilities to determine the condition of the river, but during the low-water season employees of the Engineers keep in constant touch with towboat operators and the Coast Guard to determine the condition of the river. The Mississippi is a river of many extremes. Its low-water season varies. On September 21, 1976, the Mississippi set a record low stage of minus 5.7 feet at Memphis. The previous low stage was minus 5.35 feet set on January 24, 1956.³ In early 1977 the river was closed several times by an ice gorge north of Cairo, Illinois. A few weeks later the river stage at Memphis was minus 4.8 feet, and the Memphis District had to conduct unusual winter dredging. On February 6, 1977, the river set another low-water mark of minus 6.0 feet, breaking the previous mark of the year before.

Record-setting low stages present serious problems for the Corps of Engineers. Low stages in the winter months make it easier for ice gorges to form. In February 1977, the ice gorge near Cairo, Illinois, was 25 inches thick, and the ice had more than 300 barges locked in its grasp. One fear was that the ice gorge might suddenly break, sending ice blocks the size of houses down the river. On a normal day about 24 tows pass the District headquarters near the river, but because of ice gorges in 1977, only about 5 tows were passing Memphis daily.⁴ The severity of the low water in 1977 was reflected in expenditures for channel maintenance. During the dredging season, more than \$14.2 million was spent to move 23,837,000 cubic yards of sediment.⁵

In 1981 the Mississippi River again set record low-water marks for Memphis District.



Dredge Henry Flad, one of nine dredges in operation around 1901.

On the last day of 1980 the river near Caruthersville, Missouri, was closed by a shallow channel, but about the time a dredge was able to get the river open, the Coast Guard closed the river a few miles downstream at Blytheville, Arkansas. During the last week of December, 27 towboats ran aground, and 67 were waiting for the Engineers to clear the river at Blytheville.

In early January 1981, the minus 6.0 feet record set in February 1977 was broken, and on January 12, 1981, the river at Memphis was closed because of shallow water near the Hernando DeSoto Bridge. The towboat *Ben McCool* was grounded under the bridge several hours before it broke itself loose. Just after the boat had worked itself free, the *Argonaut* went aground near the same location.⁶ The Coast Guard asked towboat operators to limit their tows to no more than 25 barges and an 8.5-foot draft. Memphis District had four dredges working at various locations, placing a tremendous strain on the budget.

Because of low water, the river near Blytheville was closed for a second time, and 22 tows pushing 180 barges were tied up waiting for the river to open. Between December 24, 1980, and the end of January 1981, 242 towboats and 2,000 barges went aground. At Memphis, the Mississippi set a record of minus 7.6 feet. The Corps of Engineers had to ask the Office of Management and Budget for additional

funds for dredging. Low river stages in 1981 cost the River Commission about \$5 million in extra funds.⁷

Improvement dredging is designed to align the channel for better navigation and is often done in the river bends. The Corps of Engineers monitors the river and decides which meander needs improvement. One of the most hazardous parts of the Mississippi River channel was Kentucky Point near New Madrid, Missouri. The channel crossed from the right bank to the left, and then sharply back to the right bank. After a channel improvement planning trip, the Engineers selected the reach for improvement. The first dredge cut consisted of a 300-foot bottom width approximately 9,000 feet long. The dredging took about 72 days, and the cut contained approximately 2,900,000 cubic yards of sediment. Towboats used the first cut while a second cut was made. The second cut was approximately 200 feet wide and contained about 1,300,000 cubic yards, and was completed in about 32 days. Once the dredging was completed, a dike was constructed to help stabilize the reach. Improvement dredging at Kentucky Point cost about \$1,600,000.⁸

A great deal of the sediment dredged from the channel is a result of bank caving; therefore, bank stabilization is a very important part of maintaining a navigable channel. The nature of the Mississippi River is to meander.

and its appetite for the adjacent banks is never satisfied. Memphis District keeps the river on a diet by covering the banks with articulated concrete revetment. Sites for revetment are determined during inspection trips by Corps personnel, but most of the revetment is placed in the bends of the river where the current does the most damage.

A bank protection unit usually works about 5 months during the low-water season, but budget constraints can shorten the period of work. The bank protection unit is self-contained, with its own power and water supply. Most of the approximately 300 workers of a bank protection unit are seasonal employees and go to other jobs when the revetment season is ended. Many times the unit has more than 100 pieces of equipment, including the quarter boats that provide housing for the workers that remain at the work site.

Employees of the unit work 10-hour shifts 6 days a week. Using mostly power-driven equipment, the workers assemble squares of concrete into mats that reach 140 feet wide, depending on requirements. After the river bank has been graded by heavy equipment, the mat is anchored to the bank of the river. As the mat is assembled, the unit backs into channel allowing the mat to be placed on the bank. On an average day, a bank protection unit can lay approximately 3,000 of the smaller squares. The cost of placing a small square is about \$120. Thus, the daily cost of the unit is about \$360,000.⁹ The bank above the revetment is protected with riprap, and after a section of the bank is protected, the entire unit is moved by towboat to another location.

The concrete squares used by the bank protection unit are cast at five casting fields, two in the Memphis District, two in the



A Corps mat sinking unit at work laying articulated concrete mattresses.



Newly formed rows of the concrete mattresses slide off the sloping deck onto the bank.

Vicksburg District, and one large one in the New Orleans District. Each year the Corps of Engineers looks at its budget and the mattress stock available and decides on the locations for revetment. After looking at the entire length of the Mississippi, the decision is made as to the quantities to be cast at each field. If more mattresses are cast in one field than another, local officials may complain of the economic effects. In determining the quantity produced at each field, the Corps must consider operational, logistical, and economic factors.¹⁰

The Mississippi River Commission has two bank protection operations: one in the Memphis District and one in the Vicksburg District. Because each wants as much work as possible, work for each unit sometimes causes conflict between the Districts. Colonel Lockridge protested the division of work in 1977, because the Vicksburg District was assigned 62 percent of the work, and Memphis only 38 percent. Also, the District Engineer indicated his unhappiness that Vicksburg was to work a dual shift, and Memphis only a single shift. According to Lockridge, the Mississippi River Commission should determine the work required, where the work was to be done, when

it was to start, and when it was to be finished. Then, the total work should be divided equally between the two Districts.¹¹ He protested the degree of control by the Commission, but indicated he would abide by the decision of the Division Engineer. Apparently the protest was only partially successful because in 1979 the division of work was 58.2 percent for Vicksburg and 41.8 percent for Memphis.¹²

The District Engineer also receives requests from residents along the river to revet their private riverfront to protect against caving banks. The Mississippi River eats away acres of unprotected land each year. Annually, property owners near the river see their property threatened during high water. A large paper mill near Wickliffe, Kentucky, requested help for caving banks in front of their mill. The company constructed a large lagoon to receive the waste from the mill and the caving bank threatened to destroy the dike that confined the lagoon. In requesting help from Memphis District, the company failed to realize that the Corps of Engineers can only spend federal funds for revetment on congressionally authorized navigation and flood control improvements.¹³

Local officials at times call on the Engineers

to provide or improve navigation on the larger tributaries of the Mississippi. The most important navigable tributary in the Memphis District is White River. The River and Harbor Act of 1892 provided for an open channel between the White River mouth and Batesville, Arkansas. The act did not specify any channel dimensions, but over the years by dredging, snagging, and contraction works, a channel 4.5 feet deep and 100 feet wide was maintained until 1942. Because of a lack of traffic, the dredging operation was discontinued, and in 1951 all channel maintenance was abandoned. The Office, Chief of Engineers, approved snagging and dredging below Augusta, Arkansas, in 1961 because the River and Harbor Act of 1960 authorized a channel depth of 5 feet and a width of 125 feet.¹⁵ Some years later a 4.5-foot by 100-foot channel was approved for the river between Augusta and Newport, Arkansas.

Because of the small channel dimensions, barge tows were limited to two barges most of the time, and were often loaded to less than capacity. In May 1967, the Senate Committee on Public Works adopted a resolution authorizing the Memphis District to conduct a study of the White River to provide improved navigation. The study was begun in 1969, but because of insufficient funding significant progress was not made until 1975.

In December 1975, at a public meeting held at Newport, Arkansas, the railroads and the Arkansas Wildlife Federation voiced strong opposition to the improvement of the White.¹⁶ The railroads opposed the project because improved navigation of the White would bring serious competition for commerce in the area. The Arkansas Wildlife Federation opposed the project because of the potential loss of wildlife habitat. However, improved navigation would benefit agriculture interests most of all. By early 1978 the study was nearing completion and the opposition was growing stronger. Colonel Lockridge had under study four alternate plans for improving navigation on the White.

When the plan favored by the Engineers

became public, the opposition intensified. The plan included deepening and expanding the channel from near its mouth to Newport, Arkansas, a distance of about 244 miles. Within the 244-mile reach, dredging would be required at 154 locations in a 56-mile stretch. Once the project was completed, the channel width would be 200 feet and its depth, 9 feet. To stabilize the dredged channel required the construction of 31 stone dikes and revetment at 13 locations. Recreational facilities were provided at two scenic overhangs, and a 25-acre camping facility. The Corps agreed to purchase up to 1,865 acres to be turned over to the U.S. Fish and Wildlife Service and the Arkansas State Game and Fish Commission to mitigate fish and wildlife losses. Total cost of the plan was \$17.2 million.

On April 19, 1979, a public meeting was held in Augusta, Arkansas, to consider the Corps' recommended plan. Even before the public meeting opponents expressed their displeasure, objecting that a planned overhang in the Crocketts Bluff area would destroy hunting and fishing in the area. They requested the overhang be moved elsewhere.¹⁷ Colonel Lockridge informed the group that their request would be considered in the final phase of planning. The opposition was vocal at the public meeting, and after it was over the president of the Grand Prairie Chapter of the Arkansas Wildlife Federation complained that Colonel Lockridge had closed the meeting before they had time to express their opposition.

During the controversy Lockridge retired, but while still in command of the District, he resisted all attempts by opponents of the plan to have a second public meeting because he believed that supporters and opponents had had ample opportunity to express themselves at the first meeting. However, Senator Bumpers joined with many residents of the lower White River Basin in demanding a second public hearing. Colonel Reno, Lockridge's successor, sent Senator Bumpers' request to the Board of Engineers for Rivers and Harbors which was reviewing the plan. The Board recommended

an additional public meeting, and Reno conducted one in DeWitt, Arkansas, on May 29, 1980.¹⁸

The opposition to the plan dominated the second public hearing because it was conducted in the center of the area of most opposition. Some residents objected because of the mitigation features and the placing of part of the dredged material in a wildlife refuge area. Dr. Hancock, leader of the opposition to the Cache River Project, questioned the benefit-cost ratio. Others opposed the plan because it would keep navigation open 95 percent of the year, while under the previous project navigation was open 75 percent of the year. Keeping the White River open 20 percent more each year was not justified by the cost. Colonel Reno indicated that he intended to recommend the project and the meeting ended with supporters and opponents still divided.¹⁹

On April 8, 1981, the United States Department of the Interior, following a recommendation by its Fish and Wildlife Service, voiced its opposition to the plan and refused permission to place dredged material in the wildlife refuge. Opponents began to lobby Governor Frank White of Arkansas to kill the project, because without a local sponsor to provide the local costs there could be no project. On April 8, 1981, the governor announced his opposition to the Corps plan based on the state's inability to furnish the local cost of \$5,760,000. He also questioned the mitigation plans and the benefit-cost ratio.²⁰ The Arkansas Game and Fish Commission voted unanimously on April 20 to oppose the White River Project. Because of Governor White's opposition, the Chief of Engineers decided to reconsider his previous approval of the plan.

It appeared that the governor's opposition would kill the project, but Governor White indicated that his earlier position on the project had been misunderstood. In July 1981, the governor reported he could not commit the state to its share of the project, but that his position was not to be taken as final and

complete rejection of the project. Governor White asked the Chief of Engineers to keep the project in the "active" status, and to continue project planning. When the state's finances permitted, the governor intended to give further consideration to the White River Project.²¹ Memphis District continued its planning for the White River Project.

Section 107 of the River and Harbor Act of 1960, as amended, provided authority for the Chief of Engineers to develop and construct small navigation projects that had not already been specifically authorized by Congress. Total federal participation was limited to \$1,000,000. Before any construction can take place, the project must be found to be feasible from an engineering standpoint, and expected economic benefits must exceed the estimated annual costs. Studies are undertaken after the District Engineer receives a formal request from a potential sponsor that is capable and willing to provide local financial requirements.

Using the authority provided by the 1960 act, Memphis District has constructed harbors at Helena, Arkansas; Hickman, Kentucky; New Madrid, Missouri; and Osceola, Arkansas. Occasionally studies indicated a harbor facility was feasible, but nothing resulted from the study. In April 1974, local officials of Wickliffe, Kentucky, requested the District Engineer to investigate the possibility of constructing harbor facilities near the city. A reconnaissance report, completed in May 1975, indicated that more detailed studies were justified. The detailed studies were initiated in June 1975 and completed in early 1981. Unfortunately, on March 11, 1981, Wickliffe officials informed the District Engineer that the city could not participate in the harbor project because of financial difficulties. On March 31, 1981, Colonel Reno recommended the studies for Wickliffe harbor be terminated. The District had expended \$78,400 for the studies.²²

A meeting with local officials of Caruthersville, Missouri, in 1972 regarding a local land fill resulted in the city obtaining harbor facilities. The Memphis District conducted a

study for a small boat harbor in 1970 and 1971, but terminated the study because of the inability of local sponsors to meet the cost-sharing responsibility. During a meeting related to the land fill, Judge D. J. Meredith of the Pemiscot County Court asked about the procedure to follow in obtaining approval for a harbor project. He was told that local interests were required to gather economic data detailing firms that might use the facility. If the data indicated sufficient use, a study could be initiated.²³ Nothing resulted from the initial contacts, but on January 27, 1974, Judge Meredith formally requested a harbor feasibility report, and indicated the County Court would be the local sponsor.

In May 1974 the studies were initiated, and in March 1975 the reconnaissance report indicated that detailed investigations were warranted.²⁴ Local officials received permission from the Missouri Department of Transportation to organize the Pemiscot County Port Authority to assume the local sponsor's role. During the detailed investigations, Colonel Lehman, then District Engineer, exhausted the funds for the Section 107 program, and postponed the project. Lehman told the Port Authority in early 1976 that next year's federal budget had no funds and existing funds would be used on studies that were nearly complete. Since Caruthersville's harbor study was in the early stages, the study was suspended until additional funds became available.

When more funds were available, the study was renewed. Lehman's successor, Colonel Lockridge, planned to submit his report to the Mississippi River Commission in late 1977, but delayed the report again. The U.S. Fish and Wildlife Service expressed some opposition to the harbor location because it might damage fish and wildlife habitat. The harbor might also destroy recreational facilities already at the location. At the direction of the Lower Mississippi Division Engineer, Memphis District began to study alternate sites for the harbor, but could not identify a suitable alternative.²⁵ The detailed report was for-

warded to the Division Engineer in August 1978.

A public meeting was held on January 30, 1979, at Caruthersville to present the results of the study. The plan recommended dredging a navigation channel 150 feet wide and 9 feet deep from the Mississippi River channel along the Triangle Boat Club Chute for a distance of 4,680 feet. Dredged material would be placed on an existing landfill that could be used to construct flood-free harbor facilities. The EPA questioned whether dredging the chute might affect the water quality, but tests by the District indicated no potential damage. The EPA questioned the accuracy of the tests and refused to approve the project unless new tests were made to determine if toxic materials were present.²⁶ Colonel Lockridge ordered additional tests in September 1979 that satisfied the EPA.

Governor Joseph P. Teasdale of Missouri asked for another delay because some state agencies believed that the dredging might violate the Endangered Species Act and various Executive Orders related to the floodplains. Additional studies indicated no endangered species was present nor was there any threat to the floodplain. The studies consumed approximately 90 days, and on July 10, 1980, Colonel Reno approved the report and forwarded it to the Chief of Engineers. The Chief of Engineers approved the report on November 4, 1980. Construction of the harbor was completed on December 30, 1980, at a total cost of about \$800,000.²⁷

As briefly outlined earlier in this work, Memphis District spent considerable effort to keep the Memphis waterfront from falling into the river and to provide harbor facilities. The Flood Control Act of 1946 provided for harbor facilities on Presidents Island, and construction was completed in 1966 at a cost of \$18.7 million. While the harbor project was nearing completion, the Senate Public Works Committee, on April 30, 1965, adopted a resolution requesting Memphis District to study the need for additional facilities.²⁸

A public meeting was held on February 24, 1966, to inform the people that the study was under way. The options selected for examination were:

1. Expanding existing facilities on Presidents Island.
2. Developing the chute west of Island 40 just north of the city that was abandoned by the Mississippi River in 1913.
3. Constructing a harbor near the mouth of the Loosahatchie River.

Extended studies were conducted in subsequent years, and in October 1974, a second public hearing was held to present four different locations for harbor facilities. Plan I, Site I, consisted of expanding the facilities on Presidents Island by dredging an additional channel and using the dredged material to create 2,000 flood-free acres for industrial development. Its cost would be approximately \$134,000,000. Plan II, Site I, consisted of constructing several channels in the Frank C. Pidgeon Industrial Development south of the city to provide water access to 2,000 acres of undeveloped land at a cost of \$103,000,000. Plan II, Site II, involved developing the chute west of Island 40 just north of the city with placement of dredged material to create 2,000 acres of land at a cost of \$124,000,000. Plan II, Site III, would be a lock and dam in the upper part of the Loosahatchie River to create a harbor below. The cost would be \$333,000,000.²⁹

City officials could not make a decision on which plan to support. Colonel Lehman needed local assurances that the city could assume its share of the costs. However, city leaders were apprehensive. Because of concerns about estimated costs, Lehman began studying alternatives. The studies centered on expanding the facilities at Presidents Island and the Pidgeon Industrial Area. The analyses indicated that a project to provide 1,000 acres of waterfront industrial lands on Presidents Island was possible at an estimated cost of \$55,187,000. Such a project would meet the future needs of the city for about 30 years. The cost of a 1,000-acre

development in the Pidgeon Industrial Area was estimated at \$60,689,400. Colonel Lehman informed Mayor Wyeth Chandler that respondents to a survey supported the project for Presidents Island, but that both plans were economically feasible.³⁰ The Memphis and Shelby County Port Commission supported the expansion of port facilities on Presidents Island.

The study was delayed because the Mississippi River Commission and the Office, Chief of Engineers, questioned the transportation benefits and land needs detailed in the report. These questions were resolved in further studies, and the draft report was sent to the Mississippi River Commission. A third public meeting was held on December 15, 1976, to present the recommended plan: construction of a new harbor channel 4.9 miles long, and using dredged fill material to create 1,000 flood-free acres for industrial development. In November 1977, the Mississippi River Commission endorsed the findings and forwarded the report to the Chief of Engineers, Lieutenant General Morris. The Chief did not question the need for additional facilities, but he did question the rationale for selecting the Presidents Island location. Before sending the report to the Secretary of the Army, he wanted the questions answered.

Reservations about the study by Morris delayed the study many months. The District Engineer submitted data supporting his selection, but Morris questioned the documentation. Local officials became concerned about the repeated delays because the Mississippi River Commission and Chief of Engineers were still questioning the location of the harbor. On June 21, 1979, Colonel Lockridge responded to the questions in a revised addendum to the harbor report. The Chief of Engineers' reservations about the report were satisfied and the report was sent to the Secretary of the Army on September 25, 1981.³¹ The city of Memphis awaits congressional funding of the approximately \$92.2 million project.

Recreation and Administration

Unlike many other engineer districts across the nation, Memphis District has not become deeply involved in recreational activities. That part of the lower Mississippi assigned to the Memphis District is mostly flat alluvial terrain, and does not easily lend itself to reservoir-type flood control structures that can be used for recreational activities. The one major exception is Lake Wappapello in the upper section of the St. Francis Basin.

The Overton Act of 1936 approved a comprehensive flood control plan for the St. Francis Basin. As part of the plan, Wappapello Dam was constructed to contain runoff from about 1,310 square miles above the dam. The dam created Lake Wappapello with a 625,000-acre-foot capacity that is released into a floodway below the dam in a systematic way.

Since its completion in 1941, Lake Wappapello has been a showcase for the Memphis District. In other parts of the District the Engineers have been criticized for lack of environmental concerns, but at Lake Wappapello many environmental projects have received awards. A 15-mile wildlife observation trail was constructed for the avid hikers, but for those not so ambitious there is a 1-mile trail with several overlooks.

In 1980 the Office, Chief of Engineers, honored Corps personnel at Lake Wappapello for their efforts to improve wildlife environment at the lake. The award was for a plan jointly sponsored by the Missouri Department of Conservation. Included in the plan were wildlife food plots on nearly 600 acres near the lake, and 150 nesting boxes for wood ducks at several locations. Also, nesting areas were built for several Canadian geese that were released in the area.² Each year Corps personnel sponsor activities at the lake that are family oriented. For instance, each year the Corps sponsors the Old Greenville Black

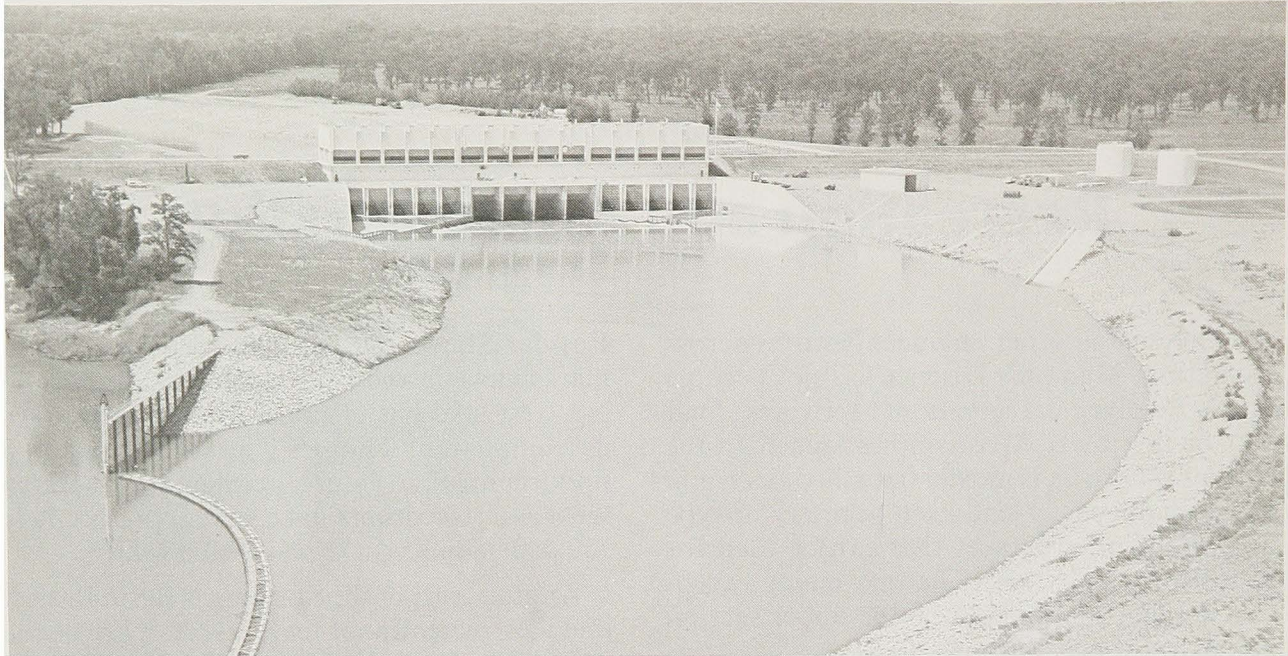
Powder Shoot and conducts competitions in marksmanship and knife and tomahawk throwing. The lake has changed dramatically since its completion. Though it is still primarily a flood control structure, residents in the area see it as a recreational lake, and approximately 750,000 people visit the lake each year.

Another part of the St. Francis Basin Project includes recreational features. As part of the project the W. G. Huxtable Pumping Station was constructed approximately 13 miles upstream from the confluence of the St. Francis River and Mississippi River. Completed in 1977, the pumping station is a combination stormwater pumping station and floodgate which has a drainage area of 2,000 square miles.

An uncontrolled weir upstream from the station impounds water and creates a lake 20 feet deep at the weir. The lake extends approximately 30 miles upstream and was part of the fish and wildlife mitigation features of the project. In cooperation with the Arkansas Game and Fish Commission, the Corps of Engineers constructed picnic areas, parking facilities, and a boat launching ramp.³

In 1965 the Arkansas Game and Fish Commission and the U.S. Fish and Wildlife Service constructed three dams in an abandoned bendway of the Mississippi River near Osceola, Arkansas, to create Lake Neark. The Corps warned officials that the first high water would wash the dams away, and two of the three dams were destroyed in January 1966. On April 11, 1974, the House Committee on Public Works requested the District Engineer to determine the feasibility of a project to rebuild Lake Neark.⁴

The Memphis District Engineer, Colonel Lehman, decided that congressional authorization for the lake would take too long. He believed the lake could be constructed quicker



W. G. Huxtable Pumping Station on the St. Frances River.

under authority granted the Chief of Engineers in the Flood Control Act of 1944 to construct recreational facilities. The study for Lake Neark, completed in 1978, recommended constructing a dike at each end of the old bendway to create a 12-mile-long lake. The cost was estimated to be \$786,000.

Because the construction of the dikes would cause less siltation in Osceola harbor and, consequently, less dredging of the harbor, a dispute over funding developed. The dispute resulted in a reevaluation of the project, and the Chief of Engineers decided that congressional approval was necessary prior to participation. A new study was initiated and completed in the summer of 1981. At a public meeting held in Osceola on August 18, 1981, the Corps presented a plan that was essentially the same as previous ones, but because of inflation, the costs had escalated to \$1.3 million.⁵ The Arkansas Game and Fish Commission supported the project over the years of study, but some members of the Commission began to have second thoughts about Lake

Neark. One member of the Commission withdrew his support because he thought the dikes would not be high enough to provide an adequate supply of water for the lake. In April 1982, the Mayor of Osceola indicated that the project was dead without the support of the Arkansas Game and Fish Commission.⁶

The Memphis District initiated its second century of work on the Mississippi River on a note of controversy. In 1975 the Division Engineer, Major General Koisch, increased the District Engineer's authority for approval of plans and specifications for all construction to a funding limit of \$1,000,000. In January 1976, much of the authority was removed by requiring District Engineers to submit detailed plans to the Division Engineer for approval. Colonel Lehman did not question the Division Engineer's overall responsibility for the Mississippi River and Tributaries Project, but did protest staff review and approval of every minute detail. Because of the review of almost every construction project, the bank protection parties had to change over 35 percent of the

final layout of the graded bank and almost every layout of articulated concrete mattress during the 1975 revetment season.⁷

In addition to the dispute with Division headquarters, Colonel Lehman had a problem with the funding of small projects in the District. The small project programs are funded under authority of several flood control laws dating back to 1946. The projects are usually funded by general appropriations. Faced with major deficits in early 1976, the acting Director of Civil Works, Brigadier General Kenneth E. McIntyre, suspended funding for the programs. All new starts for small projects were suspended and all available funds were to be expended on completing projects already under way. No reconnaissance reports or detailed project reports were to be started until new funding became available. More than 18 projects were affected by the funding squeeze. Later in the year the funding freeze was thawed.

Colonel Lockridge inherited a District with a payroll of more than \$23.3 million. Within the District there were 771 permanent employees, 646 temporary employees, and two trainees.⁸ One of the major problems faced by Colonel Lockridge was to improve the planning functions of Memphis District. Time after time the District had failed to meet milestones set at the beginning of a project. The delays were caused by many things, including project reevaluation, law suits, program reviews, work load of employees, new regulations, and the many levels of review. Nevertheless, the District Engineer intended to increase performance by shifting 37 employees to planning activities, but the move was only partially successful.

Colonel Lockridge was replaced as District Engineer by Colonel William H. Reno in June 1979.⁹ Colonel Reno faced many of the same problems of delay in getting studies completed and construction under way. In 1981 the Memphis District had more than \$50 million in projects under construction, or ready for

construction, but the District was 50 employees short of its total authorization of 680 full-time employees.¹⁰

In August 1981, Colonel John F. Hatch replaced Colonel Reno as District Engineer. Colonel Hatch was faced with further cutbacks of personnel ordered by the Reagan Administration. In September 1981, the Division Engineer ordered a reduction of 50 employees for the Memphis District as part of a program to reduce the workforce along the Mississippi by 392 jobs by October 1, 1982.¹¹ The cuts prompted the combination of the construction and operations divisions.

Part of the manpower reduction will lead to a transfer of some responsibilities in the Memphis District. The west bank levee of the Mississippi River from Commerce to Birds Point in Missouri will be transferred to the St. Louis District. The Memphis District will retain responsibility for the operation of New Madrid Floodway. Also, the administration of Lake Wappapello and the St. Francis Basin-Little River Diversion project will be transferred to St. Louis District.¹²

Budget reductions planned for the next few years will result in the Memphis District reducing its civil works program. According to Colonel Hatch, anticipated cutbacks will eliminate dredging for all Corps managed harbors in the District, including Memphis.¹³

The Corps of Engineers started its second century of work on the Mississippi in the Memphis vicinity in 1976. The first 6 years of the new center of work was relatively quiet. Many of the old environmental controversies that plagued the District have been resolved or are in the process of being resolved. Memphis District realizes that it has a responsibility for balancing the economic and environmental benefits of its numerous projects. The reduction in funding and the transfer of responsibilities to other Districts will result in a smaller visible role for the Memphis District, but the District will adjust to priorities set by higher authorities.

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